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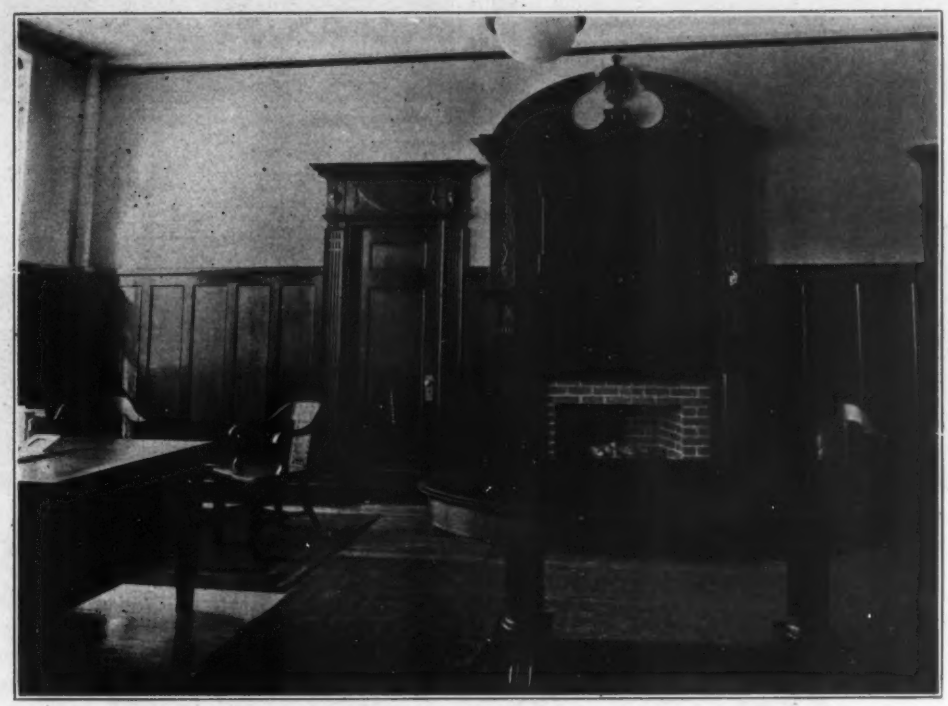


MASTER'S OFFICE, BOYS' TRADE SCHOOL, BOSTON, MASS.

A SCHOOL JOB

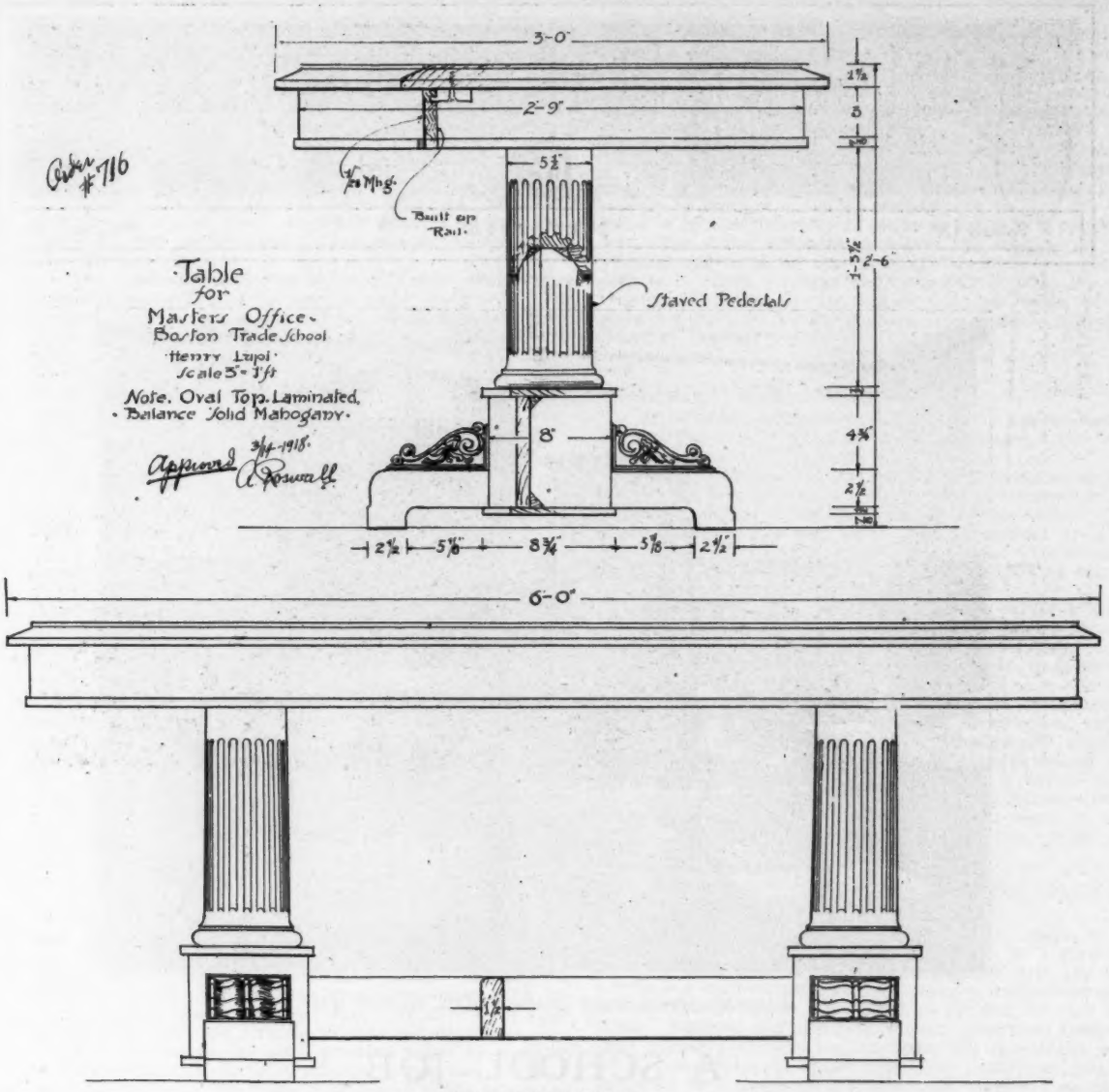
Andrew Roswall, Head of Cabinet Making and Carpentry,
Boston Trade School

WE ARE all of a more or less sceptical turn of mind, and therefore, the writer was not surprised at the doubtful attitude expressed by architects and authorities when plans, sketches and specifications for interior woodwork and furniture, shown in the illustrations, were submitted for their approval. It was the consensus of opinion that work of this type, requiring exactness of high degree, could only be accomplished by workmen with years of experience and was too far advanced for boys to undertake, boys ranging from 14 to 17 years of age, from one to three years of school training on a workday of only three hours and a half duration.

However, the work is completed and the doubters are silenced. And it requires close inspection of the whole to fully appreciate its quality. A severe critic has judged it to be of a quality that would be a credit to a high-class concern.

This job has clearly demonstrated that commercial work of the highest type can be taught in a trade school, and for the benefit of schools who anticipate doing work of this kind in the future, the writer who has had charge of this job from start to finish, will explain to the readers of the INDUSTRIAL ARTS MAGAZINE how this job was carried thru to completion. Several years ago a similar office, or "den" was fitted up in quarter-sawed gumwood for the superintendent of schools in the city of Boston, by boys of this department.

This work created favorable comments from the school authorities, and consent was obtained to leave one room unfinished in the new Boys' Trade School building, that students might have an opportunity of



DETAILS OF TABLE.
One of the Rapid Shop Sketches Made and Used by Student. See Stock List on Page 261.

fitting up this room with furniture and woodwork as a part of their training.

The room selected for the work was the office of the director, on account of the number of doors of various sizes, fireplace which required a mantel, and bookcases which had to be built into a certain wall space. The furniture from the old building was used until the new work was completed.

When plans for the new building had been accepted from the architect, they were turned over to the woodworking department of the school for the information of the class. The plans were gone over carefully and their meaning explained to the class; a copy of the plan was made ¾ of an inch to the foot, the plans of the architect being only ⅛ inch to 12 inches.

Desks, table and chairs, drawn to same scale were cut out and pinned on the plan in their proper location. In using this plan students were able to visualize at a glance the whole outlay of the room.

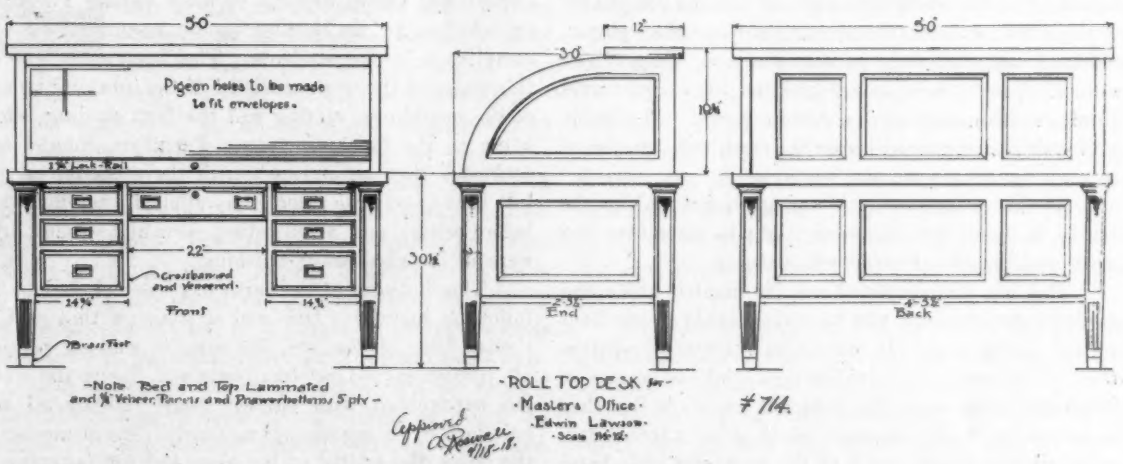
After the size of the furniture and the location of the same had been decided upon, rough sketches of the intended treatment of walls, doors, mantel and bookcases were made. These sketches were submitted to authorities and the architect for their approval. Consultation with the architect led to a few changes in the original sketches, and then the finished scale-drawings were made of plan and elevations of room. This work required considerable time, being the actual designing and planning of work on paper. Tracings and blue prints were made to work upon in the shop. While a number of the students were working on the drawings, others were designing and drawing the furniture. Each piece was designed to harmonize with the woodwork around the room. Full-size details of construction were

THE JOB IN PROGRESS.
Above—Assembling the Roll Top Desk. Mill Room—Stock being milled for office.
Below—Assembling or cabinet shop; Furniture for office in construction. Carving Architrave for clock over door.

made for all parts of the job. These drawings proved later on of valuable assistance as working drawings in the shop.

The next step was the making out of bills of materials or stock lists. The importance of mathematics and correct measuring was impressed upon the student at this time. Detail drawings were laid out on large tables, and the students assigned to measure out each part on the drawings, naming the same, and marking down on stock list dimensions, giving correct finish sizes in lengths, widths and thickness, in addition to instructions regarding milling and assembling.

In addition to stock lists, poles were laid out and marked, each part of the work marked on the same in full size. Polework enabled the students to check and correct any errors on the stock lists, and the poles were used during the construction in laying out the work, and as a check against mistakes. The principal reason for doing this work is the training of students on fine woodwork; the class as a whole could not begin at once



DETAILS OF THE ROLL TOP DESK.
Rapid Shop Drawing Made and Used by Student.

on this project, as only students who were able to do advanced work were selected, grouped and assigned to various parts of the whole. Thus, two students started on the mantel, a group of four on bookcases, four on chairs, and from time to time another group was added on other parts of the job, as they were able to do this type of work.

After a group of students had completed a certain section, during the progression of the work, they were changed to another part of the woodwork or furniture, to insure all the same opportunity and experience.

The latter request was granted and a notable example of this phase of the work is the urn which adorns the top of the mantel. It was taken home on Friday night by the brothers mentioned, and was carved and brought back on the following Monday. The short time consumed in doing the work would do credit to an expert carver when considering the size of the urn, which is 20 inches high and 12 inches in diameter, and the flutings and beading from $\frac{7}{8}$ inch in diameter down, also the fact that the largest part of the work was end-wood.

A VIEW OF THE OFFICE, LOOKING TOWARD THE CORRIDOR DOOR.

Millwork was then commenced. Stock was cut in the rough, marked for identification from stock lists, and laid out on mill trucks together with detail drawings, pole stock lists and blueprints. Each truck contained a job complete and was marked to identify the contents. Trucks were moved from machine to machine according to the operations required for the completion of the millwork from swingsaw to jointer, surface planer, mortiser and tenoner, boring machine, shaper and sander. Trucks were moved and the work was routed similar to methods used in a modern plant. All possible millwork was completed before the stock was transferred to the assembling room and benchroom.

At this point the stock was again assorted on the trucks in order that the work might be assembled and used, and the actual construction begun.

The first job completed was the mantel, which was made by two brothers, who have since made an excellent record in the trade. It may be of interest to mention that, at this period of construction, students became so interested in the work that a request was made that they be allowed to work Saturdays, which is not a school day, or be allowed to take parts of the work and tools home to work upon.

During the assembling period when general construction was carried on, special parts were made in the mill, including mouldings, turnings, and scrolls for carving. The whole job having the nature of special design, and intended to meet certain standard requirements, it was necessary to shape, grind and temper cutters and knives to form separate parts. The work in addition to the setting up of machines, was accomplished by the students. The final operations on this phase of the work consisted of the breaking around of the mouldings, carving and the final sanding before going to the finishing room. Furniture, mantel and bookcases were all finished, with the exception of the last coat of varnish which was applied simultaneously before setting up. Wainscoting, door and window trim were all installed before finishing.

The finishing of the parts was accomplished in the following manner: One coat of stain, a thin coat of shellac filler, shellac and five coats of rubbing varnish, all varnish sanded between coats and finally the whole job handrubbed with pumice stone, rubbing oil and haircloth to an egg-shell gloss finish. The trimming of the doors, the setting of the glass and the fastening of the exterior hardware completed the work with the ex-

ception of the planing of the floors and shellacing the same. The latter was accomplished by groups of students, five in each group, alternating every other day working on a three and one-half hour day.

The material of construction was Philippine mahogany thruout, with the exception of the panels. The latter were made of five-ply, the cove was made of pine, with poplar crossbanding and was finished on the outside in veneer, straight-figured African mahogany. The table, desktop and writing beds are all laminated, the cove made from ⅞ inch by 1½ inch pine strips, mahogany crossbanding and ¼ inch outside mahogany veneer. The doors were laminated in the same manner, which proved an intricate problem to solve. All doors in the building were flush ash-doors, without any paneling, which made it necessary to construct doors of this pattern on one side, with paneling to match wainscoting in mahogany on the other. The difficulty arose in constructing a door that would not have a tendency to warp. The defect was overcome by laying an ash veneer heavy enough to counteract the pull of the mahogany frame on the opposite side.

The chairs were all made from Philippine mahogany, the curved backs were glued up on forms in presses, from ¼ inch, five-ply stock. The shaping of the parts was done with templets on a shaper, to insure uniform size and shape. The saddle seats were made from 1½ inch mahogany and routed with special cutters on a boring mchine; all joints on the chairs are dowel joints.

The whole job as completed, was a credit to every student who worked on the same and materially assisted each one who entered a trade in the acquirement of trade knowledge and pecuniary improvement.

ORDER NO. 716 BOSTON INDUSTRIAL SCHOOL FOR BOYS

ARTICLE Oval Table DEPT. OF CARPENTRY AND CAB. MAKING STOCK LIST Office Mus. School

CHECK	QUAN.		LENGTH	WIDTH	THICKNESS	DESCRIPTION	QUAN. USED
	1	Top	72	36	1½	Mhg	
	1	Built up Rim		4	1½	See Detail	
	2	Columns	14½	7	7		
	2	Base Blocks	7½	7½	⅞	See Detail	
	2	Feet	24	6	3¾		
	4	" Blocks	4	6	1¾		
	2	Base	9	9	½		
	4	"	7	8	¾	Filler	
	4	"	4⅞	6	¾	Mhg Mhg	
	2	"	4⅞	6	6¾		
	4	Base Brackets	6¾	5½	¼	Mhg See Detail	
	4	" "	3	5½	¼	" " "	
	4	" "	5⅞	5	3	" " "	
	1	Stretcher	36½	4	1¾	2" Tenon	
	2	Cleats		8	¾	Ash	

Typical Stock Bill.

Costs of materials, which have been the only expense, have not been excessive considering the results in training and improvement in building. Instead of making a few pieces of furniture of little or no commercial value, each student engaged in the work contributed his share toward a high-grade product, and in doing so, received valuable training in productive work and a broad conception of trade requirements.

The school has a monument of its skilled students, the instructors a problem satisfactorily solved, and last and most important of all, the students have been trained to meet commercial requirements, which is well worth the time consumed in accomplishment.

THE POSSIBILITIES OF MANUAL TRAINING THRU PRACTICAL PROBLEMS

Victor Randel, Supervisor of Manual Arts, University High School, Columbia, Mo.

THE idea of manual training thru practical problems is one that appeals to students and to the general public. The present tendency in all industrial education is to become more and more practical and to bear a closer relation to the present activities of the student. In all industrial education that is federally aided, the tendency is to give students training in work as nearly like the work that the journeyman is doing, as is possible under school conditions. For example, carpentry is no longer taught by giving a course in joint making, nor in merely acquiring the use of certain tools thru the making of exercise pieces; but it is taught by giving students experience in the actual construction of real buildings.

The passage of the Smith-Hughes Act has relieved manual training of some of the things for which the public has been holding manual training responsible. The trade school, whose business it is to train carpenters, will now be held responsible for turning out students who can go on the "job" and do a grade of work expected of the average journeyman. Likewise other trade or industrial schools will be held responsible for their products in the form of trained workers.

This leaves manual training with a more definite task—that of giving boys experience in a variety of manual activities involving the use and manipulation of tools and materials for general educational purposes rather than for general trade training.

It is believed by the writer that this kind of training can best be acquired thru the doing of practical problems.

In order to carry out this idea in actual practice, a different kind of organization is required than is found in the average manual training shop.

Ordinarily the shop teacher has his course for the entire year planned even before the opening of school. All who have had any experience in shop teaching know

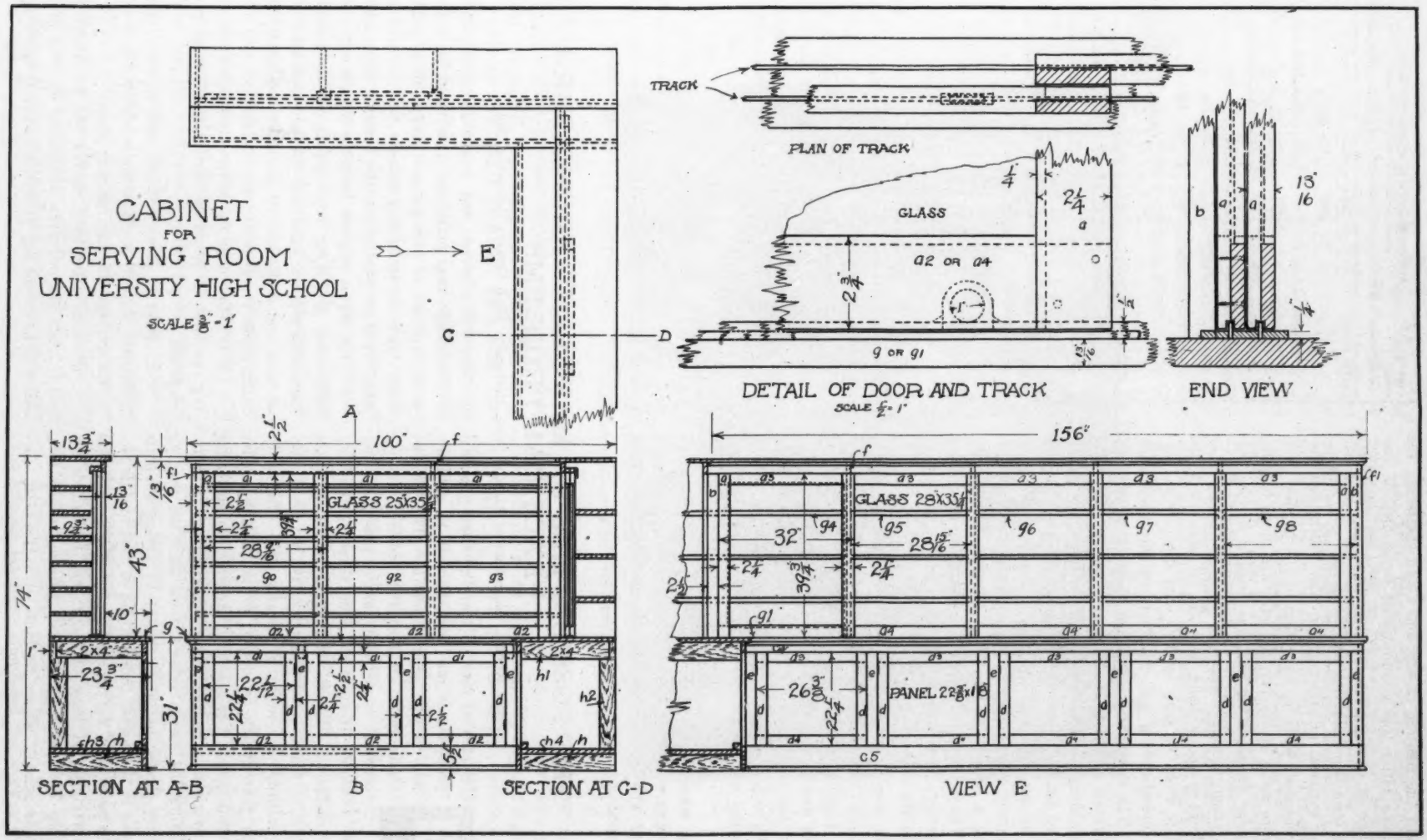


Fig. 1. Details of Construction, Cabinet for Serving Room in the University High School, Columbia, Mo.

that it is absolutely necessary to do some planning, even to the extent of having stock cut and ready to hand out, before admitting a class of live boys to a shop. A certain amount of this planning beforehand is necessary for one who expects to make up his course primarily from practical problems.

In order to make up a course from practical problems, the first thing to be considered is the matter of finding the problems. The second task is that of organizing these problems in such a way that they may be successfully taught to inexperienced boys.

The problem of securing practical problems for instructional purposes may be done in any one, or all of the following ways: First, by announcing in the local papers that the manual training shop is ready to do practical jobs in woodwork, concrete work, painting or any other line that the shop may be prepared to offer. In such announcements, it should be made plain that the primary purpose of such work is educational. Another method is that of having the students with the aid of their parents or friends, list all of the things they would like to make, or to have made, for their own use in or about the home. Still another source of practical problems is that of receiving requisitions from the school superintendent or other school officials for things to be made or done for use in the school. From whatever source these problems may come it is the business of the manual training supervisor, or

STOCK BILL FOR CABINET

Pcs	Th.	Wd	Lgth	For	Cut By	Assembled By
16	13/16"	2¼"	40"	Doors at (a)	Deaton O	Doors at a a' a"
3	"	2¼"	29"	" " (a')	Vandiver L	Deaton & Vandiver
3	"	2¾"	29"	" " (a")	Hunter H	" "
5	"	2¼"	32"	" " (a³)	Turner W	" "
5	"	2¾"	32"	" " (a⁴)	" "	" "
16	"	2¼"	22¼"	" " (d)	Daley E	Door at d d' d"
3	"	2¼"	22¼"	" " (d')	" "	Hunter & Turner
3	"	2¾"	22¾"	" " (d")	" "	Doors at (d d' d")
5	"	2¾"	26"	" " (d³)	Vandiver	Turner & Deaton
5	"	2¾"	26"	" " (d⁴)		
10	"	"	22¾"	Casing - (e)	Turner W	
1	"	"	77"	" " (C')	Williamson	
1	"	"	87"	" " (C)	"	
1	"	5½"	77"	Base - (C")	Hunter H	Deaton and Turner
1	"	2¼"	156"	Casing - (C³)	"	
1	"	"	146"	" " (C⁴)	"	" "
4	"	"	40"	" " (b)	Deaton	" "
1	"	5¼"	146"	Base - (C⁴)	Hunter	" "
7	"	9¾"	42¼"	Partition - (f)	Johnson	" "
2	"	12¾"	42¼"	End " (f')	Vandiver	" "
2	"	22¾"	30¼"	" " (F")	Turner W	" "
1	"	"	100"	Shelf - (g)	Daley	Daley and
1	"	"	148"	" - (g')	Williamson	Williamson
6	"	9¾"	29"	" " (g")	"	
6	"	"		" " (g³)	Payne	Payne and
6	"	"		" " (g⁴)	"	Vandiver
3	"	"		" " (g⁵)	Johnson	
9	"	"	28¾"	" " (g' g" g³)		
11	2	4	21"	Jointed (h)	Williamson	Williamson and
11	"	"	20"	" " (h')	Daley E	Daley
11	"	"	24½"	Stud " (h")	"	"
1	13/16	21"	100"	Floor - (h³)	"	" "
1	"	"	150	" " (h⁴)	Williamson	" "
3	4	11½"	18"	Panel at (d d' d")	Ellis	Hunter & Turner
5	"	22¾"	18"	" " (d d' d")	"	Turner & Deaton
3		25"	35¼"	Glass (a a' a")		Daley
5		27"	35¼"	" (a a' a")		Huntington

Fig. 2. Stock Bill and Work Record.

DEATON, OTTO		10-12 SECTION			
Job where or for	Reference	Processes	A to B	Hrs.	Gr.
16 Pcs. 13/16"x2¼"x40", Doors (a)	Essentials, 11,12,13	Having planing	0	4	M
4 Pcs 13/16"x2¼"x40", Casing (b)	Essentials, 5,6,18,19, 20,25,26,28,29	" "			
Assembling Door (a,a1,a2)	NW in W pp. 70,80,81. Essentials, 101	Gaging Rabbeting Miter sawing	0	1	S
Assembling carcase at c5,c4,e,g1,h,c3,f.	NW in W.,128, 129,130 Essentials 2,3,10,14	Half lap joint Gluing, Fastening with Screws Back saw, Nailing	0	8	S
Fit and hang doors (d,d3,d4)	W.W.for S.S.- Grif. art. 251	Fitting and Hinging -gaging, chiseling screws	0	4	S
			0	4	M

Fig. 3. Student's Work Card.

teacher, to organize them in such a way that they may be taught to the best advantage. It is expected that such work will be arranged as far as possible in the order of difficulty. It may even be advisable at times for the teacher to require certain students to make some purely exercise pieces just for the purpose of learning how to do a certain process or to learn the feel of certain tools.

In projects of any considerable size the matter of arrangement according to the order of difficulty can usually be worked out within the one large project. Such was the case in making the different parts of the cabinet that was built in the serving room of the University High School. Figure 4.

The work was done by a manual training class of high school boys who worked two hours each day. The shop is equipped with the usual amount of individual equipment and one miter saw as the only machine.

A majority of the boys had had only about two months of experience in manual training.

Since the work was done largely by groups of boys it was necessary to provide some means of keeping a record of the part done by each individual. The following method was worked out to meet the need. First a stock bill with space for other information was made up. See Figure 2. The letters a, a1, a2, etc., on the stock bill refer to locations on the working drawing Figure 1. Under the heading "cut by" and "assembled by" was placed the name of the student doing each specified job.

In order to keep a more complete record of work done by each student, individual cards were provided, Figure 3. On the individual card is kept a record of the job, "Where or for," "Reference," "Processes" involved in doing the job, "A to B," attention to business, hours required, and a grade of workmanship.

By the use of some such cards as this it is possible for the teacher to give a different reference each day to each individual if the nature of the work makes it necessary.

In giving references no attempt was made to follow any one textbook on manual training; but rather to give references, from any available texts, having some bearing on the particular jobs to be done. All reference books are placed on a long table in one corner of the shop so that they are accessible to the students

Fig. 4. A Part of the Cabinet.

at any time. As a matter of checking up to see if the students have been reading the references assigned, the writer finds as he inspects the work of each student that each one is glad to tell just what he learned in the reference that helped him on his problem. In manipulating the cards it is a good plan for the teacher to jot down on a separate slip of paper for each student before class time, the particular job to be done and the reference to be read. These little slips may be placed on each individual's bench before class time, or they may be passed out to each student at the time of roll call.

Each student had access to the large assembly drawing, Figure 1. Whenever the necessary information could not be found on the assembly drawing a detail drawing was furnished.

In getting out stock all pieces were cut to approximate lengths. Finally jigs were used where there were two or more pieces to be cut to the same length. The miter saw was used for cutting most of the joints where close fits were required.

In order to simplify the work of constructing doors so as to make it possible for inexperienced students to do good work, the half lap joint was used as shown in the detail of the glass door in Figure 1. Each joint was fastened with glue and two ¾ screws.

Two one-inch ball bearing metal sheaves were mortised into the lower rail of each glass door. A one-eighth inch groove was also cut into the lower edge of the rail. This allowed the little wheels to ride on the metal track, thus insuring an easy rolling door.

Before hinging any of the small doors, shown in Figure 1, a careful demonstration on how to hinge a door was given. Each student was then given two short pieces of 13/16" stock to be properly hinged together with a 2-inch hinge.

Thus we see that in such a problem as this the students get all of the experience and even more than they would ordinarily get in making small exercise pieces. Each piece made bears a relation to every other piece.

This is only one of the problems that this class of students has worked out. Another class has recently finished building a small garage. This work involved the making of a drawing, laying out the foundation, excavating for floor and walls, building forms for concrete, mixing and pouring concrete, building the superstructure, mixing the paint and painting the building, besides figuring all bills and buying all materials.

Still another class has recently finished building some large tables. Several students have built wagon boxes, gates, and floor lamps. Each student has had opportunity to make some things for himself; but every article that has been made is to be used.

EXHIBIT OF MANUAL TRAINING WORK, HIGH SCHOOL, WINFIELD, KANS.
L. H. Alberty, Instructor.

A SIMPLE, COMPREHENSIVE CARD RECORD SCHEME FOR THE SHOPS OF A VOCATIONAL SCHOOL

R. V. Rickcord, District Representative, Education and Training Section,
United States Shipping Board, E. F. C.

THE present card record scheme is an attempt to eliminate so far as possible the indefinite and arbitrary elements in the awarding of marks or credits for practical work turned out in a vocational school. There can be little doubt that when an instructor is asked merely to look over a piece of work and arbitrarily award an "A" or a "B", unfair marking and indefinite records are almost invariably the result. To ensure the proper awarding of compensation to a workman, a manufacturing establishment sets up time cards and cost systems, price setting arrangements, stringent clock systems, arrangements with trade unions, and master's agreements. These were designed to guarantee, in a general way, that the compensation, namely, the workman's pay, shall be accurately representative of the workman's worth or value.

In vocational schools, when students at a certain period are to be compensated, no provisions of the character named, have been made. And yet the service rendered by the student-workman represents a money value which is entitled to the same accurate record and equitable adjustment that is applied to the journeyman mechanic. When the period in vocational school life is reached where compensation is merited, a system whereby that compensation can be measured must be devised. The more important considerations here involved are placed in the following order:

1. Compulsion on the part of the instructor and supervisor to recognize the proper subdivision of a vocational school course, such as the subdivision of time that shall be spent on each machine in some particular shop.

2. The possibility on the part of the supervisor to see that such courses, once laid out, are properly carried out by the instructors, in suitable instructional order.

3. The establishment of student's permanent records which take into consideration both his quality and speed as a workman.

4. The possibility of graduating a student when he has become proficient in a course, taking into consideration speed and quality of workmanship and not merely when he has spent a certain length of time in that course and can produce work of fairly good appearance.

In addition it is desirable that the card record scheme should (1) permit of an arrangement for posting assignments, whereby the supervisor, parent, principal and instructor, as well as the student, can see at any time what is being done in that shop; (2) embrace some arrangement whereby each piece of work can be charged up correctly, not merely by counting the student's time, against the complete project.

A description of the specimen cards attached hereto attempts to show how nearly these ends can be accomplished; a card for the patternmaking department, Fig. 1, deals with the following description. Referring then to the card in question, it will be seen that under the heading "Pattern Making Department" are two

PATTERN MAKING DEPARTMENT					
Name		Grade	Month		
Project	For whom		Job No. K		Card No.
OPERATION	ASSIGNMENT		TIME		
			Date	Date	Date
Planning 1					
Machine 2					
Bandsaw 3					
Variety Saw 4					
Jointer 5					
Benchwork 6					
Laying-out 7					
Cutting, Fitting 8					
Assembling 9					
Finishing 10					
Woodturning 11					
Moulding 12					
(a) Journeyman's Time — estimated	(b) Boy's Time	(c) Quality Decimal	Points $\frac{a \times a \times c}{b}$		

FIG. 1.

horizontal rows of items which need very little explanation, except that some are optional and need only be filled in by the instructor if he so desires, as in the case of the item "for whom", which would ordinarily be neglected, except perhaps in the case of the printing department where thousands of pieces of one kind are sometimes turned out at a time for different departments or schools. The three columns headed "operation", "assignment", and "time", are perhaps more important. Below the word "operation" are set down the various operations undertaken in the department, with several vacant spaces in order that other and special operations can be filled in. It will be seen that the "operations" are divided roughly into two kinds, namely those of machine work and those of bench work. It will be seen too that provision is made under "machine work"

Note—The writer's thanks are due to Mr. Alfred P. Fletcher, assistant superintendent, Cleveland, Ohio, for collaboration in working out the card record scheme described in this article.

for taking care of machine work of different kinds; the machine operations 3, 4 and 5 (on the card) are intended to deal with quantity production, to record the time, say, taken to make 100 pieces on the bandsaw, variety saw or jointer, whereas against the word machine is to be recorded the total time spent on the bandsaw, variety saw and jointer to make one piece of work ready for the benchwork operations; in the case of the making of one piece, the operations would be so short, in some cases as short as one minute only, that the labor of itemizing into the individual machine operations and adding would be unjustified, clerical help for taking care of any card recording scheme in a school being a serious factor to contend with.

Under the heading "Assignment" and against the operation which is to be undertaken by the student, the instructor places a cross or mark or even the name of the part to be made. This is not intended to replace verbal instructions on the part of the instructor, but to enable the student to seek out his work and the instructor to plan ahead. In the triple column under the heading "Date" is provided room for the date and spaces in which the student can write the time in hours and tenths of an hour spent on the various operations on that date. The triple columns allow of the cards being used for three days if the job happens to be a long one and for the whole job if the job happens to last less than three days, or for a day or portion of a day, or portion of a job. In any case no one card is good for more than three days or for more than one job, no matter how sparsely the spaces under "Time" happen to be filled in.

The four spaces in the bottom row contain in condensed form, the information itemized in other parts of the card; this, with the addition of certain other information, easily set down by the instructor, is the vital material which the sought for data is extracted. The item (a) "Journeyman's time" is very easily recorded by the instructor; it is arrived at in the same way as in making out the estimate for any piece of work and can be recorded almost at once. It serves two purposes (1) to enable the cost of a piece of work to be properly charged up according to journeyman's time and (perhaps) rate, rather than according to student's time which may be anything and (2) it sets for a student a standard of time on which to work.

It will not be questioned that a standard of both speed and quality make for greater efforts and the development of consciousness of the correct commercial practice. Is it not a fact that The National Cash Register Company sets a standard of speed and quality for salesmen and elects those who satisfy that standard to the 100-point Club? Do not some of the Insurance Companies promote their men to the Century Club on these same conditions? Will not the standard of time eliminate a great deal of waste at both ends of a job. time wasted in starting and time wasted in finishing a job?

The item (b) is a simple total of the student's time added together from the various spaces under "Time." The item (c) "Quality Decimal" is the one most usually guessed at by the instructors. In the present instance it is proposed to state the quality of a piece of work in a percentage or in some number less than 10 representing a percentage; that is, to set the maximum mark of quality at 100 or 10 and then to subtract a given amount for each fault or deficiency.

For example, in awarding a quality mark for a finished pattern, after setting a maximum standard of 10, if it showed poor finish, poor application of color, one point could be deducted. If it proved inaccurate in dimensions, another point could be deducted; absence of uniformity in the thickness of the various members would perhaps call for the deduction of another point, making a quality decimal for the piece of work of 7, or 7/10ths or 70%.

This may seem something of a lengthy process but after an instructor had devised a list of faults for which he intended to subtract points, the subtractions could be determined as rapidly as the instructor could count. In other words the scheme advocated is that employed for judging animals in which so many points are deducted for each departure from a standard. If however a piece of work is so badly done that it proved to be unusable for commercial purposes, or below any low standard of quality that the instructor may set, no credit should be given to the student for it. The last item, the matter of "points", the manner of arriving at them, etc., will be discussed towards the end of this article.

In the meantime it may be well to route a piece of work to show the process whereby this piece of work is taken care of by the card record scheme under consideration. Let it be supposed that a superintendent or director of vocational education wish to issue an order for two lathes. It is advocated, in order to save labor in the school itself, where clerical help is so often strenuously refused, that the director use a pad or booklet of very thin paper, on which he write out his order and make as many duplicates with carbon paper as there are departments handling the job, plus one for himself and one for the principal of the school to which

Department of Public Instruction
Rochester, N. Y.

Make 12" Lathes
(as per principal)

Quantity 2 Job #15

Date May 2nd, 16 To ~~Sample~~, drgs

Mach M ✓	Patt K	Print P	Mill L.
Cab C	Fini F	Drawg D	Elec E.

FIG. 2.

the order is to be issued. The form should be something like the following, (Fig. 2) each leaf being identically the same:

On the superintendent's or director's order form, then is filled in the information called for by the wording; when this is done, the director, after removing the carbons, except those facing the leaf which is to go to the principal, and the leaf which is to be retained by himself, marks each slip separately with a cross or other mark in the spaces provided, to show to which department that particular slip is to go. By this means each slip which is to go to a department has a mark on it against that department, while two slips, one for the director and one for the principal, have marked on them all the departments to which a slip has been sent. Thus with very little clerical labor a slip is made out for each person concerned with the doing of the job and no writing is called for by the principal.

Coming down to the specific case of the order for the two lathes, the slips would read "Make lathes—Two; Job No. 75; May 2nd, 1916, to Drgs." It is necessary here to send a copy of the order to each the drafting, pattern, machine departments and one to the principal. The director therefore makes out five copies. Each slip intended for a department has a mark in the space provided for the department, one department—one mark—one slip. The slip for the principal is marked for all the departments as explained. The principal distributes the slips to the three departments under him.

Of course, there may be preliminary discussion between principal, director, drafting department, etc., which no card or form of instruction can hope to entirely eliminate. In due course, drawings will be finished and handed over to the pattern and machine shops.

The pattern shop proceeds something like this; a student has finished a job and goes to the instructor for another; the instructor wants to give him the job or (say) making the patterns for the cone of the headstock of the lathe. The student's name, grade, etc., has already been placed on the time and assignment card by a clerk which must be supplied to the school for this work. The clerk can get out a number of cards for each student in advance and these are kept ready for use by the instructor. The instructor then marks the project and the job number, or merely the job number; he also places a mark or cross against the operation he wants the student to do, in this case operation No. 2 (Machine) on the card for the patternmaking department, and also against any or all of the bench work operations.

If the instructor wishes to be more specific he can place the name of the part in the space opposite the operation, as "Cone for h'stock." At the same time he estimates the journeyman's time and places it in the space provided. Before the student proceeds with the job he takes note of the time and places it on the back of the card; he then places the card in a rack provided for the purpose. A cheap time stamp can be used for recording time. The rack should provide a space for each student and no space should be vacant at any time except after a student's absence of three or more days. By this means a director, principal, instructor or parent can see at any time exactly what each boy is doing.

At the end of each period, before the job has been finished, the time should be filled in by the student before leaving the room. The card is good for two days more—three in all. At the end of the third day, or when the job is finished, if this takes place in less than three days, the student completes the filling in of the time and takes the card to the instructor, who then places down on the card a quality decimal as explained previously in this article. After this, the card is dropped into a box kept for the purpose. The boxes are cleared every morning or evening by the clerk, who proceeds to add up the student's time and places the totals in the space provided for the purpose.

Note very carefully that the assignment should be very small, just enough for one day, or two days, or three days at most. The reason for this is that if the job has not been completed in the three days, tho the instructor may have estimated less than three days, another card will have to be made out and fastened to the original so that the estimated time and the actual time employed can be kept side by side. When this happens the cards should be numbered No. 1 and No. 2 in the space marked "Card No." Under no circumstances should so much as a week from the time of starting a job, elapse before the card or cards as above, properly and sufficiently filled out, be taken up by the clerk for entry. By this means—and this is the reason for making the card a three day card—the student's record will always be complete to within a week.

The only space now remaining which must be filled in by the clerk is that headed "Points $\frac{a \times a \times c}{b}$; as this may be said to be the clearing house thru which the value of the whole scheme proceeds, it will be dealt with at greater length.

It is difficult in dividing up a course into the various operations, to estimate the time for each operation so that a student will acquire maximum skill in some operations without sacrificing the others. It is a fact that the average student naturally tends to be speedy at the sacrifice of quality, or to be a good workman at the sacrifice of speed. Those that excel, or are moderately good at both, are uncommon.

The arrangement or formula suggested in the last item in the card is designed to bring about a state of balance between the student's natural unmolded tendencies. At the same time note should be taken of the fact that it is quite impossible to take a number of students and expect that at the end of a given period, they may, one and all, be fitted to enter the industrial field. Adequate preparation must, after all, be the goal of modern vocational work. Necessarily, the time taken

to bring students to standards of efficiency must vary with individual requirements.

To establish the relation between quality and speed of working, the results can be stated in somewhat mathematical language. If X is the quality required in a piece of work, may not some students at the end of the year reach the X plus Y level and others the X minus Y level? And under the circumstances would it not be reasonable to graduate those who attained the X plus Y level a length of time proportional to Y before the end of one year or any given period, and also to compel those who reach only the X minus Y level at the end of the given period to spend a length of time proportional to Y in addition to that period, in order that they may enter the field approximately similarly and equally equipped?

Note that this does not say that the X plus Y's should leave before the end of the school year, nor the X minus Y's after that time, but that final credits should be awarded at these plus or minus periods. The matter of leaving or staying on would of course depend upon other circumstances.

The inference naturally follows that if the student is clever at some things, the time he spends on those things should be short and vice versa. Graphically this may be represented in a diagram (Fig. 3).

A more definite medium must now be sought for comparing the student's speed with another, irrespective of the job he does. The best medium to be employed is one whereby the time of each is compared with a journeyman's time, which can be gauged by the journeyman-instructor with accuracy. Supposing that a piece of work could be done by a journeyman in four hours and that student No. 1 finished the work in 6 hours and student No. 2 finished it in 8 hours, by multiplying the journeyman's man by the ratio or percentage $\frac{\text{(journeyman's time)}}{\text{(student's time)}}$ a mark or figure is obtained in each case in inverse proportion to the time the student takes to do the job; thus

In the case of student No. 1. $\frac{4 \times 4}{6}$ equals $2\ 2/3$

In the case of student No. 2. $\frac{4 \times 4}{8}$ equals 2.

Let us apply the same rule to a school term, or at least to a period longer than would be taken in doing a single job, which period may be required by the average student to become proficient in a certain kind of operation. Let it be supposed that such a student does in 20 hours what would take a journeyman 10 hours to do, but nevertheless was satisfactory in speed and quality for his age and grade, his graduating point for that work, or subdivision of a course, could be set at $\frac{10 \times 10}{20}$ equals 5 *points*. If the quality of his work averaged .8 or 80% and this quality mark was considered satisfactory for graduating a student, then the number of points he should be required to get in the 20 hours should be 5x.8 equals 4 points. If the student is better than the average he will obtain his 4 points in less than 20 hours and if he is less so than the average he will take longer than 20 hours to obtain his 4 points. There will still remain flexibility as to speed and quality, some students having more quality than speed and vice versa.

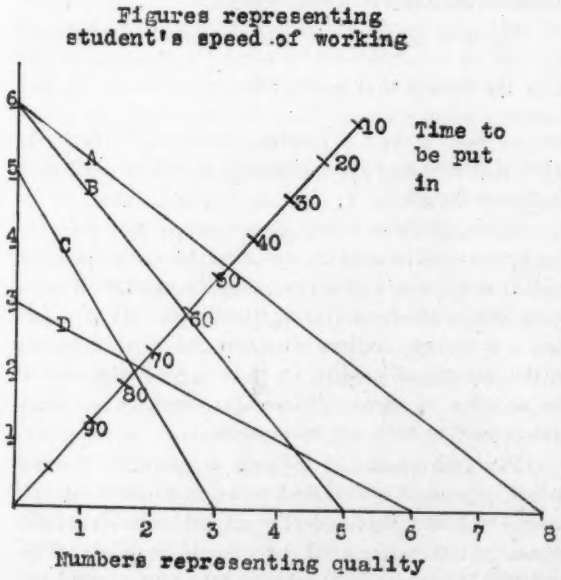


FIG. 3.

If the time taken on the job A be represented by speed figure 6 and the quality by 8 then the time to be spent on that particular kind of work may be represented by the figure on the 45 degree line and is about 45, but if the quality be dropped to 5 as in job B, then the time to be spent will be 60. Jobs C and D show graphically the effect of varying speed and quality.

How shall a machine shop instructor divide the periods to be spent on bench, lathe, milling, shaping, planing, drilling operations in terms of "points" so that there may be an even distribution of proficiency in each at the end of the school year? He can scarcely, if at all, gauge these things in advance. It would be as difficult for an instructor to calculate the number of points that a student should obtain at the end of a given period as it would be difficult for a man to throw a ball with a predetermined speed by moving his arm thru a certain distance with a certain pressure, relying only on his judgment to give him this distance and pressure. But knowing the speed when once the ball has been thrown, it would not be a difficult matter to calculate the distance thru which the arm moves and the force it exerts thru that distance.

The matter of determining the points which should be earned by a student for the various operations can be determined by a parallel procedure. The instructor must apply the experience of one or more terms. He must give a number of students a set of similar operations, and must note at what stages the average student becomes proficient in those operations. The number of points earned by the average should be the number of points required by each student before giving him

DEPARTMENT OF PUBLIC INSTRUCTION, ROCHESTER, N. Y. K-PATTERN MAKING DEPARTMENT

MONTHLY ACCOMPLISHMENT RECORD BY DAYS

Name				Grade				Month, Year					For instructor's notes								Points for present month	Points for previous months	Total Points
OPERATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Planning 1																							
Machine 2																							
Bandsaw 3																							
Variety Saw 4																							
Jointer 5																							
Benchwork 6																							
Laying-out 7																							
Cutting, Fitting 8																							
Assembling 9																							
Finishing 10																							
Woodturning 11																							
Moulding 12																							

Fig. 4. Students' Monthly Record.

a unit-diploma for each kind of operation, lathe work, milling, etc. A series of unit-diplomas should entitle the student to a diploma for the course.

Note that thruout the scheme stress is laid on the fact that the instructor is enabled to mark the student's work uniformly even tho no two students perform the same job. In plain language it should be the instructor's aim to gauge what the average student can do in points during a term and then to make that the standard. The number of points can be increased year by year.

Going back now to the "routing" of a job it would be practical to employ a chart similar to those in use in factories recording time, production and wage. These are supplied with horizontal and vertical figures and can be interpreted at a glance.

Having obtained the points on the assignment cards, these are then transferred to a large monthly accomplishment sheet (Fig. 4) which is provided for all the students in each department. The work or operations should be done in instructional order but on special occasions these may be done as happens to be the most convenient in the shop.

As soon as the student has acquired the number of points required by the instructor for a certain operation, or rather series of operations of the same kind, he receives the unit-diploma or any other token of accomplishment. This information in regard to the points is read of in the right hand columns of the monthly sheets, where the points for the months and those of the previous months are totaled. The instructor reads the cards regularly once or twice a month to ascertain who is entitled to these diplomas. This, under certain circumstances, can be done by the clerk. Examination of these monthly cards by the principal and director enables them to determine whether students perform the necessary variety of work.

The efficiency of the arrangement centers around the small assignment and time cards. The scheme of which these are the essential part basis should be regarded as an instrument to be used by the instructor largely as he thinks fit, not merely as a series of question blanks to be filled in in approved form. The installation and running of the scheme must be worked out by the instructor for himself from the beginning and must be administered in such a way as to suit his own conditions.

Below are summarized, tho in some instances at the risk of repetition, the items which the card scheme is designed to cover or bring within possibility of accomplishment. The instructor is urged to keep these in mind and so adapt the cards to his own needs that the service for which the cards are designed may be realized.

1. To allow anybody to see exactly at all times what each student is doing.

2. To allow of graduating on "point" system

which makes it unnecessary to hold to fixed graduation periods.

3. To increase time on bench or machine inversely as the quality and speed of working on the part of the student.

4. To allow of the awarding of small certificates or unit-diplomas for bench work, machine work, etc.

5. To encourage or positivize among instructors the use of the unit system.

6. To encourage the student to diversify rather, than to do the thing he likes best.

7. To enable the instructor to mark the students uniformly, no two students doing the same jobs.

8. To eliminate the possibility of exploitation by keeping the student at one thing too long, beyond that point where it ceases to be to the student's advantage.

9. To enable anyone to see exactly what any student has done over any given period.

10. To enable the instructor to make out assignments in proper form and the student to make out his own time.

11. To permit of the proper charging of time, according to the journeyman's rather than the student's time.

12. To set a definite standard of quality and time for the student.

THE MODEL SHARPIE, OR YACHT

John W. Cavileer, Hillside Junior High School, Montclair, N. J.

THE annual boat race held by the public schools of Montclair in June, 1919, proved to be one of the most successful events of the kind in this part of the country.

There were about one hundred boats of all classes among which the 24-inch Sharpie or Yacht and the 36-inch motorboat driven under its own power, proved to be the most popular.

There were gold, silver and bronze medals given for first, second and third prizes in both workmanship and speed. Large crowds witnessed the races on the Tuesday and Thursday when the preliminaries were run off, but the banks of the Edgemont Park Lake were crowded to overflowing when the finals were run off on the following Saturday. The races were covered by photographers representing several daily and weekly newspapers.

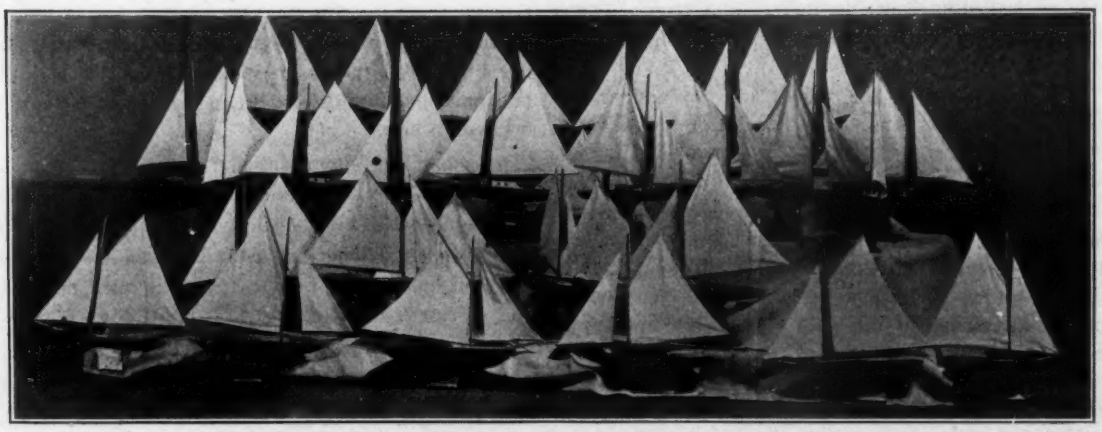
I shall endeavor to go into detail in a very small way as to the construction of the boats in the accompanying drawings. The problem is a large one, taken up by the seventh and eighth grade classes entirely elective as to the type the boy wished to make. A small sum was charged for materials, probably covering two-thirds of the cost.

Boat construction makes a fine correlation problem with practically all the studies that a boy takes up in the junior high school grades; especially is it very closely connected with geography, mathematics, commerce and drawing. It also is a very good training for the eye, for it is constructed by lines; then too there are a variety of tools used, giving good tool practice.

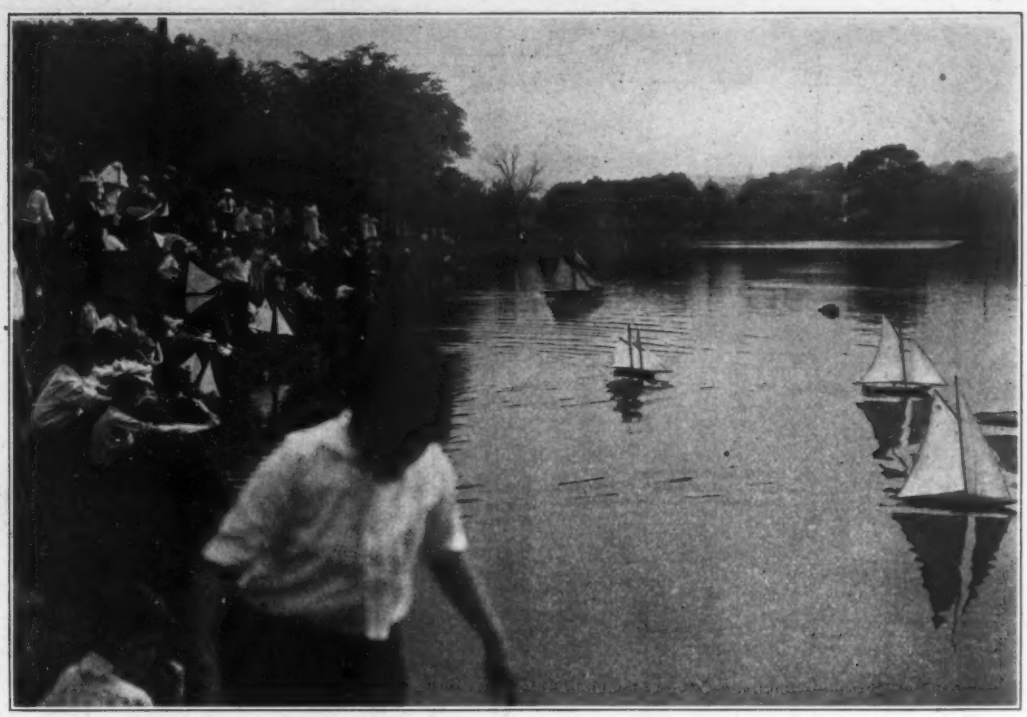
The Sharpie as shown by the drawing is made from white pine 2″x8½″x24″. A much better line can be obtained from stock 2½″ or 3″ thick. Then a ⅜″ shear can be had along the deck line, thus making the boat more seaworthy. Then too, more can be cut away from the bottom, giving somewhat of a slope effect. Some of the boys glued an upper deck on them ¾″ to 1″ high and 10″ long in the bow, thus raising the bowsprit higher from the water, and stopping the bow from going under in heavy sea way.

I shall take up the description of the making of the Sharpie, or Yacht, in practically the same manner as it was worked out by the classes.

The project being done in a junior high school system enabled the metal and wood shops to correlate each part very closely. The metal parts were taken up first: Namely, the keel, rudder, mast strut, rudder port,



A FEW OF THE YACHTS MADE BY THE AUTHOR'S STUDENTS.



START OF ONE OF THE "HEATS" AT THE ANNUAL YACHT RACE IN MONTCLAIR, N. J.

tiller, five cleats, and two travelers. In the construction, thread cutting was taken up both with the tap and die on the ⅛″ rudder post, and on the two small nuts that hold the tiller in place (see drawing). The rudder post was split up one inch at the bottom, to allow the galvanized rudder to be inserted and soldered.

The rudder port consists of a piece of ¼″ or 3/16″ brass tubing 2½″ long and a piece of sheet glass gauge 22, the size of which should be in the shape of a triangle 1″x1¼″. A hole is bored in the center of the triangle, the size of the tubing used to allow the same to pass thru it is about 3/16 of an inch in which place it is to be soldered.

The tiller was made from a piece of 22 gauge sheet brass ¼″x2″. A hole 5/32″ was bored in each end, one to allow the sheet rope and rubber band to pass thru, and the other to fit over the rudder post and between the two hexagonal nuts number 5-40. It was then given a one-half twist in the middle.

Attention is called to the steering arrangement. The tiller is turned backward and a two-inch rubber band is fastened from the end to a screw eye in the deck, thus holding the rudder in a straight position. One end of the sheet is fastened to the boom about seven inches from its end and passes thru the hole in the tiller and back thru a screw-eye in the boom, then to a small ring on the traveler very near the stem of the boat and on to the cleat. Thus the harder the wind blows the harder the rudder is pulled over and with a very little adjustment the boat can be made to go in a straight course, notwithstanding the light and hard blows of wind.

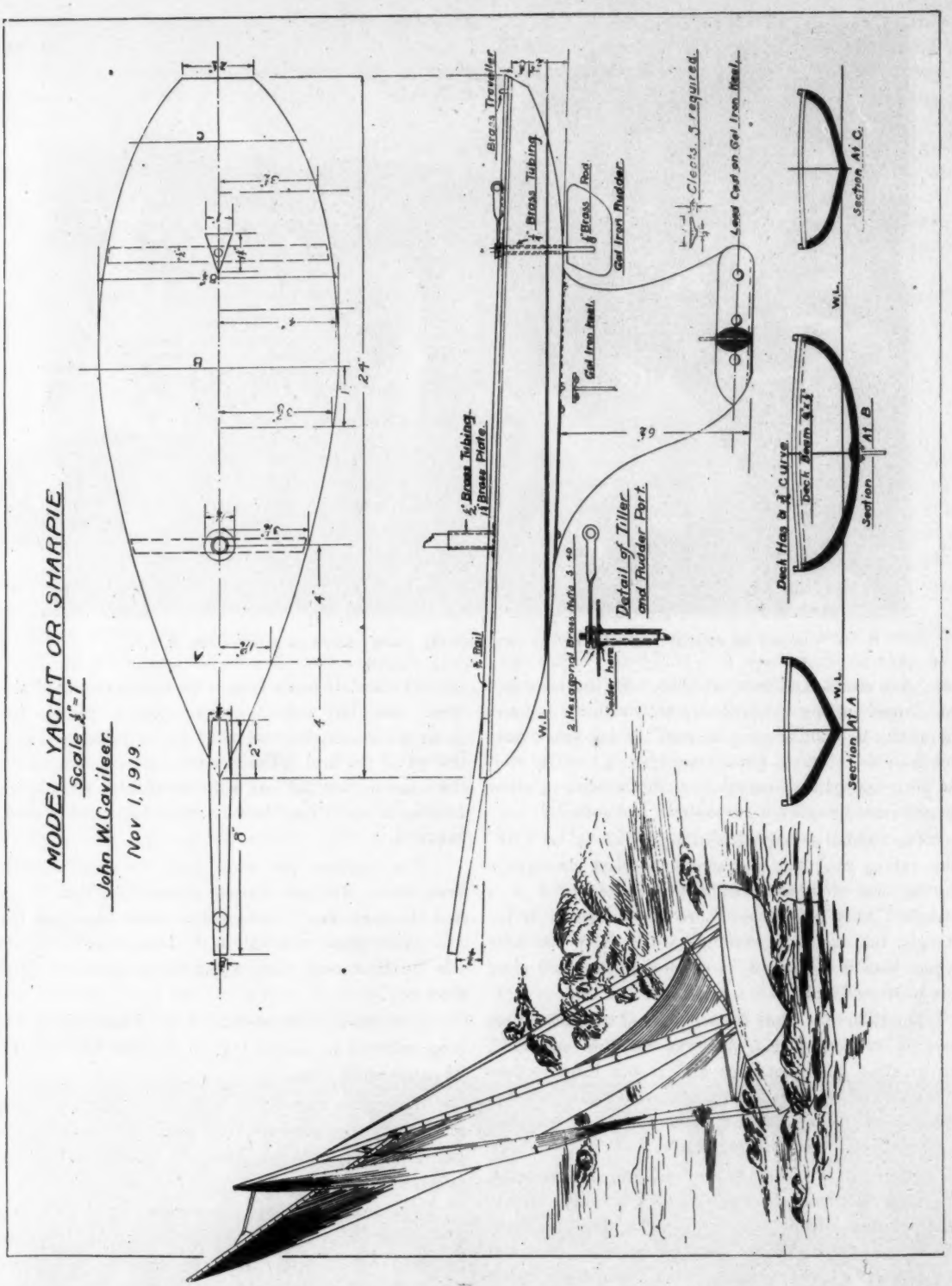
The keel is made from a piece of galvanized sheet iron. Each boy makes a cast or mold to cast the lead. A series of one-quarter-inch holes is bored across the bottom of the keel. The wooden form is clamped over the holes so that the lead will run thru and unite, thus holding it on. From three-fourths to a pound of lead is required.

The travelers are made from 18-gauge tempered brass wire. The gib traveler should be about 5″ long and the main one 2″ long. The cleats were cut from ¼″ square brass rod, ¾″ or 1″ long, a piece ¼″x⅛″ was cut from each side leaving the shape found in the drawing.

The mast strut consists of ½″ brass tubing 1½″ long, soldered to a piece 1¼″ in diameter and cut from 22-gauge sheet brass.

The spars, namely the mast, boom, gaft, gib boom and bow-spirit are carved from white pine, and after being carefully sanded, are finished with two coats of spar varnish.

The hull of the boat comes next. It is made from a piece of white pine 2″ to 2½″ thick, 8¼″ wide and 24″ long. The outline is plotted after which a line is drawn from the bow to the middle of the stern, both on the deck and on the stern. Two lines are then drawn around the hull one 8″ from the bow and one 6″ from the back. The profile of the bow and stern are scribed free-hand from the above mentioned lines. The shaping of the outside is done primarily with the draw-knife, spoke shave and wood rasp. The inside is mostly done



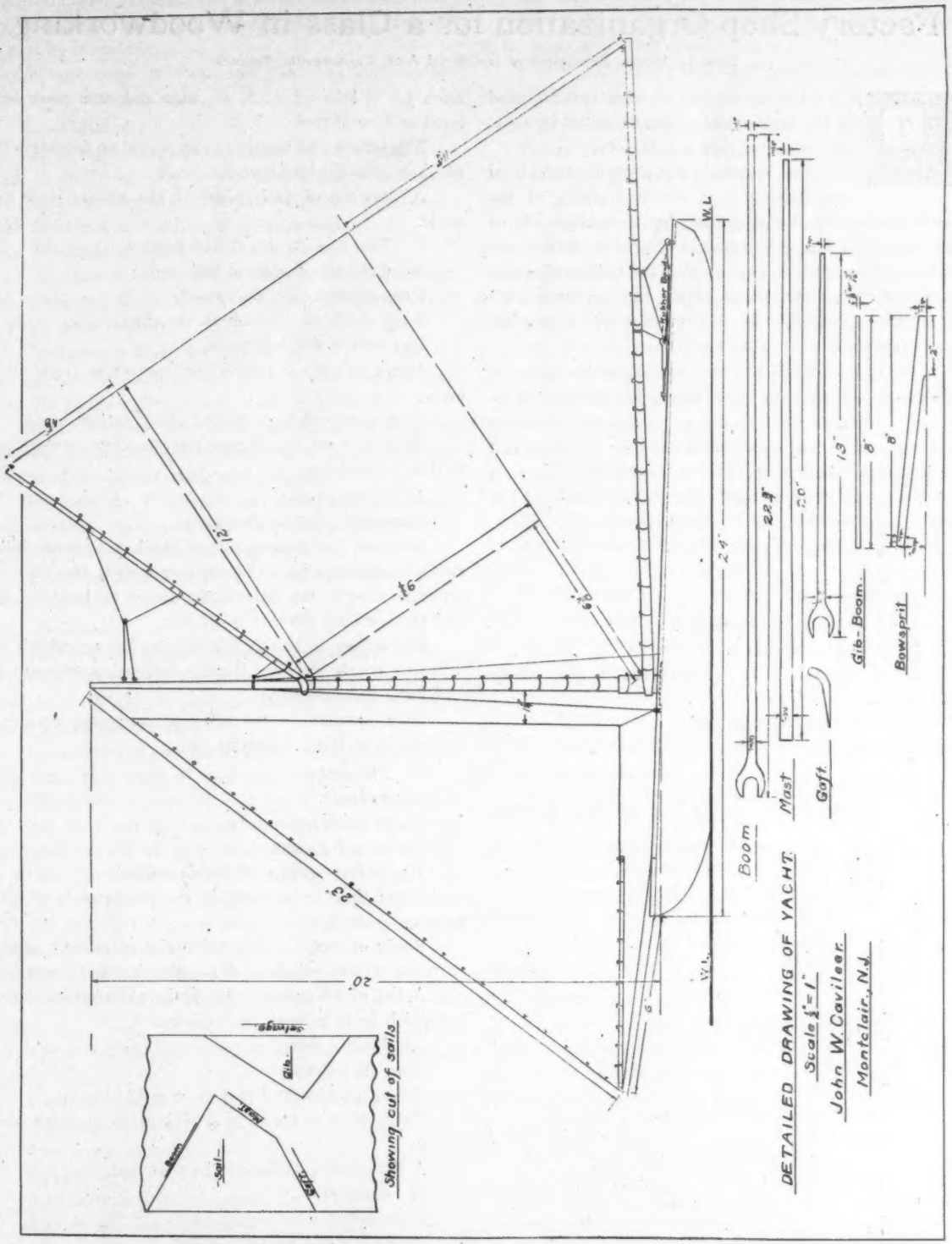
DETAILS OF THE 24-INCH SHARPIE.

with the gouge altho boring a few holes around the edge will help.

The author tries to get the hulls hollowed out enough to see light thru when held up to an electric light, or about 1/4" thick.

Deck beams are placed at the eight and six-inch lines. The sails are cut from long cloth, one yard of a very good quality is required. The boys use their own ideas about the color and finish, although a few combinations are suggested.

The cost per boat to each boy is approximately 75 cents. The cost of the hull is 40 cents and 35 cents for



DETAILS OF THE 24-INCH SHARPIE.

long cloth used in the sails. The boats are probably worth $20 to $25, judging from the prices asked by the leading art stores.

Each boy becomes more interested as he sees his boat begin to assume form, and it is difficult to stop them at the end of the period.

Factory Shop Organization for a Class in Woodworking

Eber L. Moore, Supervisor of Industrial Arts, Connersville, Indiana

THE following outline of work is being used in the high school of Connersville, Indiana, and is found very satisfactory.

The system is not a purely vocational one, neither is it wholly training of the hand for its educational values, but a combination of the two. The aim of the plan is to give the boy a general knowledge or bird's-eye view of the industrial world by working thru this school plant. As he passes thru he gathers knowledge by individual study and practical experience.

He does not become an experienced machinist but he establishes a foundation upon which he can build if he wishes. He does not become as proficient in cabinet making as if he had spent the whole year on individual projects and that alone, but he has received a good foundation in this line, and enlarged his vision of the whole industrial world at the same time.

I. The Shop Equipment:

1. A bench room.
2. A tool room.
3. A finishing department.
4. A lumber department.
5. A machine room (jointer, bench, saw, planer and lathe).
6. A drafting department.

II. The Force:

20 pupils.

1. (A bookkeeper acting also as shop superintendent.)
2. (2 draftsman.)
3. (Tool room man.)
4. (Planer man.)
5. (Sawyer.)
6. (Lumberman.)
7. (2 finishers.)
8. Joinerman.
9. 10 bench workers.

III. The Duties:

1. Bookkeeper.
   - (a) Book all orders for projects.
   - (b) List all orders for lumber from order book, also hardware stain, etc.
   - (c) Book all bills of individual projects from other classes.
   - (d) Figure cost of each project.
   - (e) Write letters ordering materials.
   - (f) Keep time of all workmen and amount of work done each day.
   - (g) Keep list of all tools and materials on hand.

2. Draftsman:

Design and draw problems as they are sent in. Each job is lettered A. B. C., etc., and each piece lettered and numbered.

The letters and number to be placed on lumber bill, which goes to the bookkeeper.

A drawing of each piece of the article is to be made.

3. Tool and Supply Room Man:

Have charge of general tool room.

Keep general tools sharpened.

Keep check on all tools in the shop.

List broken and lost tools.

Issues no tools or supplies without order from foreman.

Keep memoranda of all out going materials.

Find answers for 50 practical questions pertaining to this department.

4. Lumberman:

Have charge of lumber stocks.

Oversees the getting out of stock as lumber bills are brought to him. Checks pieces with blue pencil corresponding to the letter and number on lumber bill, and O. K.'s bills when it is all out.

Extra time to be spent in getting out an exhibit of different woods showing lumber defects, quartersawed, and hard and soft woods.

Find answers to 50 practical questions covering lumbering, milling, foresting, etc.

5. Planerman:

Runs planer.

Keeps machine in order.

Keeps motor cleaned.

Works from group foreman's orders.

Extra time to be spent in studying speeds of different machines.

Study of motor. Determine size of pulleys, study currents, reostat switches. Make sketches and drawings.

A list of 50 questions on various mechanical lines for which he is to work out answers.

6. Jointer Man:

Does all jointing.

Keeps machine and motors in good shape.

Extra time is spent in studying his machine and power.

A list of 50 questions to be answered.

7. Sawyer:

Runs bench saw.

Keeps saw and motor in shape.

Works from foreman's orders.

Extra time spent in studying his machine and power.

50 questions to be answered on the saw and its manipulations and on other mechanical devices.

8. Benchman:

Divided into as many groups as necessary. Each

group to have a foreman and to be furnished with working drawings. Each benchman supplied with drawing of part he is making.

50 questions on tools and processes and various other lines of bench work.

9. Finishers:

Do sandpapering and staining. Extra time to be spent in finishing different panels with different finishes and experimenting with different stains and varnishes.

50 questions on finishing to be answered.

IV. Schedule of Class:

The class is to be shifted every two or three weeks and at the end of the term every one shall have worked in every department.

V. Preliminary Work for Beginners.

In case the whole class has had no previous shop work the following outline of work is followed:

First, three or four weeks are spent in studying drawing, making sample working drawings and learning the use of the square, scale and triangles.

The next six to twelve weeks are spent in studying tool processes, making a series of joints from the drawings they made in their drawing work.

Following this preliminary work the factory plan can be started.

VI. Problems:

The first problems attempted are simple in construction, not beyond the power of the class to do individually. A simple problem worked out by my class was a school garden sign.

It consisted of two parts, a stake 2″ square and 30″ long and a face board 5″ wide and 20″ long.

The front corners of the board were chamfered ¼″ and the front face made very smooth. The stake was made smooth on four sides, a notch cut in the top in which the board was to fit, and the ends pointed. After the pieces were assembled they were painted gray with the face of the board white and the name "School Garden" stenciled on the white face.

Two hundred of these were made.

Every member of the class was busy with his special task.

The ten benchmen were divided in the following manner:

2 stake pointers.
1 to smooth faces.
2 to notch stakes.
2 chamferers.
2 to assemble the two parts.
1 to smooth sides of stakes.

The bookkeeper was busy checking up on work of individual workman of shop, keeping record of work done, figuring lumber bill, and keeping record of oncoming supplies and material for next problems.

The lumberman was busy checking upon stock leaving the lumber racks and helping machine men get required stock.

The machine men were busy getting out the stock.

The toolman was busy drafting the next problem to be taken up by the class.

The finishers were kept busy painting the signs and stenciling the name.

VII. Reference, Lectures, Observation Trips:

Reference books and magazines are kept on file in the bookkeepers' department and are available at any time.

At the beginning of the term when the whole class is at the bench working on the exercises a general lecture is given on finishing, one on lumbering, the care and manipulation of machines, and one on the care and use of tools.

At intervals during the term trips are taken thru different industries.

On these trips certain specific points are to be looked for, as:

1. Kind of work done.
2. Difference between skilled and unskilled labor.
3. Relation of departments of factory.
4. Output of departments of factory.
5. Relation of departments of factory.
6. What makes a mechanic?
7. Chance for social uplift among employees.
8. What place has apprenticeship?
9. How much drawing? Kind.
10. The organization.
11. Its relation to city and community.
12. Enumerate phases of industry where different school subjects studied are applied or may be applied.

VIII. Apprenticeship.

In starting the class the best pupil adapted for the special department is placed in that department. The two first draftsmen remain while the new one coming in acts as apprentice until the next change is made.

The outgoing bookkeeper also remains a few periods until the new one becomes familiar with the duties.

To a lesser extent this is true with the other departments.

IX. Grades:

At the end of each week the bookkeeper gets out a blank which contains name of pupil, date and department in which he is working. This is turned over to the teacher who makes out the grade roll. On this blank is a space for "How to improve" suggestions.

X. What the Pupil Should Accomplish:

At the end of the year the pupil should understand the manipulating of the above machines, their care, construction, and what kind of work can be done on them.

He should understand finishing from a practical side as well as the theoretical side.

He should know how to sharpen any tool in the shop and know many new things connected with the supplies. This the pupil gets from his tool room experience.

He should know more about management, business,

and responsibility from his bookkeeping and shop superintendent work.

He should know about hand tools and hand tool processes from experience as foreman.

His drafting experience should develop much responsibility and forethought as well as give him practical experience in drafting. When acting as lumberman the problems of forestry, milling, and lumbering in general are made clear to him.

Besides this knowledge gained thru actual work, 350 questions will have been answered by the pupil at the completion of the term's work.

A SUCCESSFUL GROUP PROJECT

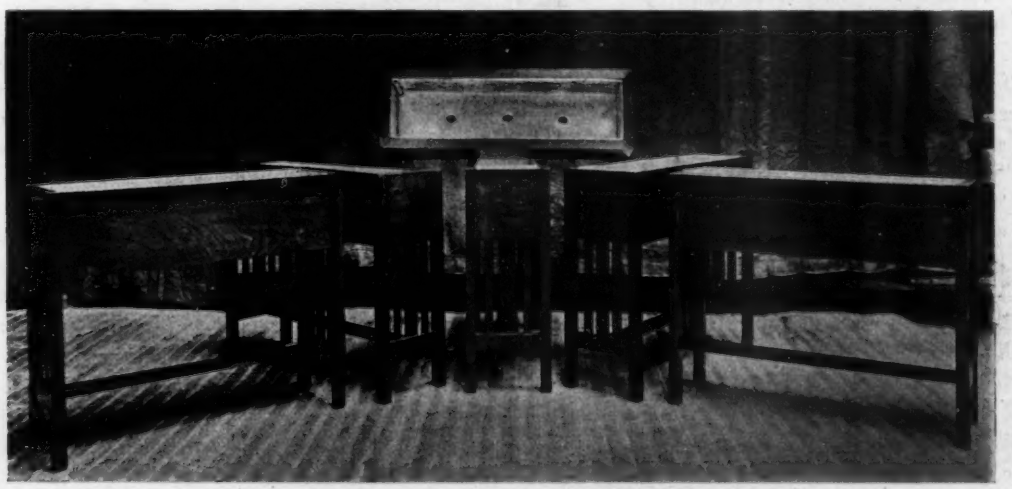
Paul E. Ferrell, Waukesha, Wis.

THE criticism is often made that manual training teachers do not give their students real life articles to make—articles that are of some value both from the boys' standpoint and that of the home. Personally I would like to connect the home with the shop. I believe if the boys get started thinking upon something, that they are interested in, the good workmanship and good designing will fall in line. Boys will soon acquire skill in handling tools if an object to be made has their interest. The human eye can pick a pleasing design from a number of poor ones. I often have a boy ask me, "Do you think this would look well?"

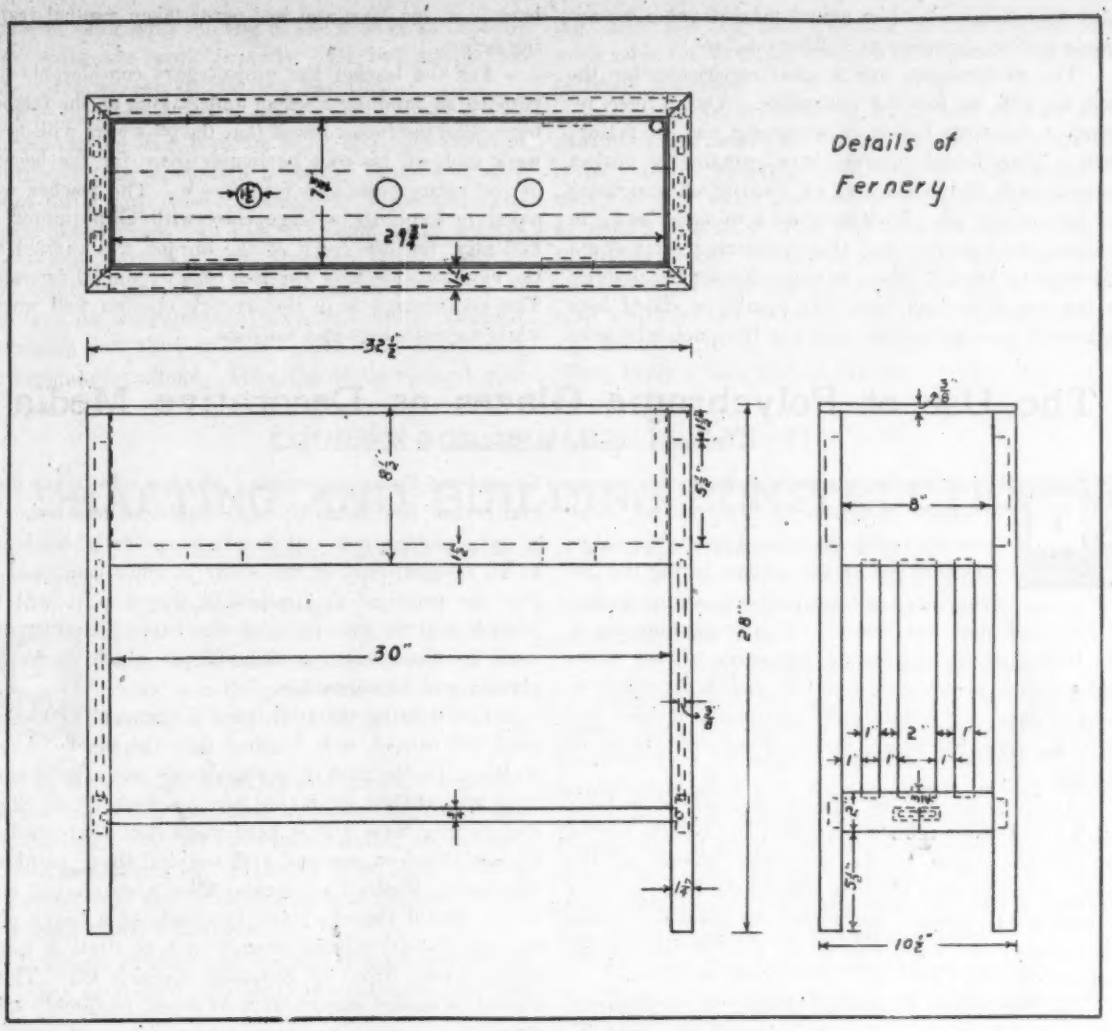
This is the method we followed in choosing our design for the ferneries. Probably the design has been used before, for this problem, but I myself have never seen one. In our stock of wood we found we would have considerable amount of thin walnut and it would be necessary to use this as much as possible. I worked the design out with the entire class. The height was considered both from the standpoint of the beauty of the design also whether it would be too high or too low. The length and width were decided upon only for the necessary space required for three ferns. The panels were put in for the additional beauty and to use our thin stock.

At this point we stopped to decide whether or not the design would have as good an appearance with or without the panels, also which would be the most pleasing three panels or slats of the same size or two small ones and one large one or just one large one. Here I drew three end views upon the blackboard showing the three mentioned above, and I found that the entire class chose the two small panels and the one large one. Later when they were in the process of assembling the ferneries I had three ends assembled as above mentioned and I had the same results. Everyone picked the one we chose as the best appearing one. After we had decided on everything the entire class made a working drawing, putting in all details. It might be stated here that the boys were not compelled to make a fernery. Out of the class of 28 only two did not make one. They both had one at home. The galvanized tanks were made at a tin shop. The boys gave a contract and received them for one dollar cheaper for each one by ordering them in a lot. They were made with two bottoms, one held the dirt up about one inch from the bottom and it had three round holes one and one-half inches in diameter. These holes were filled with a sponge extending down to the true bottom. In one corner a pipe extended down to pour the water into the bottom. The water will run along and the sponges soak it up into the dirt.

Upon completing the drawing, the next undertaking was to obtain enough walnut. All the boys desired walnut and suggested a number of places where we could obtain old, discarded furniture. This was decided to be the source of the wood. Arrangements were



A FEW OF THE FERNERIES MADE BY THE AUTHOR'S PUPILS.



Details of Fernery Made by the Author's Students.

made with several of the boys and myself to meet on Saturday morning and go to a second hand store and look for the walnut. We had unusual success as we obtained enough from one store to fill our needs. This wood was in the form of beds, washstands, dressers and tables. The entire lot was falling to pieces and was of value only for the wood.

Our furniture was drayed to the shop on the same afternoon and the following Monday the class set to work upon the worst part of the whole job, that of taking the furniture apart and sorting the wood. I organized the class into four groups. The first group took the furniture apart. The second group took out all of the nails and screws so not to endanger any tools. The third group sorted the stock and put into separate piles the lumber that could be used economically for the large parts. The fourth group put the lumber away.

After this was all completed we set to work upon the getting out of the parts. Here again I organized the class into groups—each group to get out a certain part. I put the most capable boys at the head of the groups as foremen. The entire process up to the assembling was carried on according to factory system, except that we did not use jigs. Every boy had his own drawing to work from. This method worked very satisfactorily. The machine work was also done by the most capable boys with machinery. There was a great deal of planing done by hand as we have not a planer. The joints for the sides were made on a jointer which was not altogether satisfactory for surfacing. Out of the entire work we only had one board cut wrong. After the boys were ready to assemble the ferneries, each part was numbered from one to twenty-six. Then each boy drew his part.

The entire cost of the wood amounted to $29.60, with $2 for the draying, making a total of $31.60. For each boy it cost $1.22 for the wood. The glue, filler and varnish cost approximately thirty cents each. This made the cost $3.52, including the pan. It would be pretty hard to estimate the value of one of them from the boys' standpoint as the majority of them when approached on the matter will tell you, "I don't believe I

want to sell mine." The actual market value we approximated at seventeen or eighteen dollars.

The undertaking was a good experience for the boys as well as for the instructor. The former received a practical lesson in designing and in factory work. They found interest in a community project whereby each in the labor of all contributed something for the good of all. They received a valuable lesson in utilizing old furniture and thus reclaiming what would otherwise be wasted. They were given extended practice in the use of various tools. It should be stated here that about one-half of the class was freshmen who were boys from the farm and had never taken manual training before.

For the teacher the project gave considerable experience in handling a school undertaking on the factory basis. The instructor found that the boys were willing to work each on his own particular piece for the benefit of the entire class and for himself. The teacher was aided in handling a large class with a minimum of difficulty, because much of the burden was carried by the more capable boys who had been appointed foremen. The undertaking is in the writer's opinion well worth while for both boys and teachers.

The Use of Polychrome Glazes as Decorative Media

Ralph G. Waring, E. Syracuse, N. Y.

THERE has been a marked tendency, among furniture designers of late, to get away from the heavy shades and effects typical of furniture put on the market during the last five years, and produce something livelier in tone and more ornamental. This is the outcome of the lifting of the depressing influences of war times and a return to the more frivolous and flashy colors of pre-war days; for certainly the pendulum, of color and applied design, has swung sharply from one extreme to the other.

And yet, where these effects are observed in their quieter and more refined examples, the results lend a considerable charm to the decorative scheme of the room. Perhaps after all, they furnish the touch of color or contrast in design, that makes for good decoration when chosen for some regard for present furnishings and decorations.

To the teacher of applied design, the ornamental relief on a floor lamp, for example, offers a good incentive for the boy in the shop who will make that lamp. To the instructor in the painting and finishing room the beautifying of that project offers much as a medium for teaching good workmanship, and the careful application of appropriate colors.

Of necessity, the choice of colors will depend largely upon the type of relief ornament used in the carving. It would be incongruous for example to use colors of red or blue on conventionalized leaves; more apt would be the use of dull gold, brown and dull greens, depending upon the type of plant or tree leaf in use as a motif. If the design has been based on the fact that the lamp standard will imitate a bronze or brass casting, then the colors should be chosen in harmony.

This subject will require careful planning on the part of the boy and his instructors in each department, and in no case should be undertaken without due consideration of the ultimate use of the lamp; as regards its contingent furnishings; the motif employed in the design; and all the features of appropriate coloring. Greys, greens, browns, orange and golds are softer, more harmonizing groupings than red, scarlet, mauve, or violet and purple arrangements. Shadow effects are generally blue for instance; high lights assume either a silver or golden cast and should be carefully developed as an integral part of the study of color composition. For the practical application in the shop it will be necessary above all else, that the carving and turned work be absolutely smooth, without which successful glazing will be impossible.

For a sizing material use a single coat of a good grade of varnish well brushed into the wood. Avoid shellac. In the case of porous woods use a good silex filler well rubbed in, taking care to clean up all edges and carving lines with a hard wood stick sharpened to a skew chisel on one end and a round sharp point on the other. Dust off all surplus filler when cleaned out. There should then be given two coats of a heavy pigmented, flat-drying undercoater such as Pratt & Lambert's, Lowe Bros. or Keystone Varnish Co. These should be sanded smooth with 00 paper, preferably split stock.

In case the undertone or base color is some shade of gold as rose, old, yellow, green, or red, lay it on the hardened undercoater with a soft one inch camel's hair brush, using enough gold-size japan to lay on smooth and even. If the undertone be of some other color, this can be secured by shading the undercoater to the proper tint with colors ground in japan and sold in tube form as:

Browns—Raw and Burnt Umber, Raw and Burnt Sienna, Van Dyke.

Reds—Am. Vermillion, Rose pink, Rose Lake, Indian Red, Turkey Red Lake.

Yellows—Canary, Lemon, Orange, Chromes, Dutch Pink, Do not use Ochre.

Greens—Chromes, light, medium and dark. Verdigris.

Blue—Prussian, Ultramarine, Cobalt, Chinese.

White—Zinc Oxide.

The base color coat should be stippled with a heavy, short bristle ox-hair brush so as to leave the surface free from brush marks and full of fine pores. This is accomplished by lightly pounding the tacky

surface of color with the end of the bristles so that the latter strike the work squarely. Do not stipple too soon, nor after the surface has hardened.

For the glazing colors use a small saucer, or varnish can cap for each separate color, mixing a sufficient quantity of tube stock with a glazing liquid composed of one-third raw linseed, two-thirds turpentine, and a little japan drier. In case the color shows a tendency to run, work in a little whiting. Any number of color combinations may be used, sometimes three or four laid on as successive coats and either stippled, brushed on very thin, or high lighted with cheese cloth to show color shadings. After the whole work of glazing, high lighting and stippling is finished, set the work aside for 24 hours or more in a warm room until perfectly hardened.

In order to preserve the brightness of tone and shading in the colors, brush on a smooth coat of boiled laundry starch prepared by mixing two tablespoons of starch in cold water and adding enough boiling water to make a thin size. This will leave the entire surface to dry in a soft, even, flat tone and when the lamp becomes soiled from much handling may be washed off with a sponge and recoated with starch thereby restoring the work to its original brightness. For a gloss effect, apply a thin coat of varnish.

COURSES FOR REHABILITATION—II

DRAFTING AND BUILDING CONSTRUCTION

Chas. R. Miller, Williamson Free School of Mechanical Trades, Williamson, Pa.

Summary of Course.

THE first three months' work of this course covers simple lettering, the elements of projection, and the principles of architectural drawing as applied to design and framing plans.

The elements of carpentry and masonry construction are introduced as related subjects. In connection with this work, the first steps in estimating are presented, covering "taking off" materials from plans, making up material bills and forming a general estimate of cost for a small frame building.

Practical English and vocational mathematics are also taken as related subjects, and continued thru the entire year.

During the second three months the elements of construction, as applied in steel building practice, are covered. This work introduces the principles of trade drawing, standard detail practice, and elementary assembling of structural shapes. Interior trim is studied as a subject in carpentry, while reinforced concrete is taken in connection with masonry work. Estimating as related to steel construction is studied during this period.

During the third three months the study of heavy framing in timber and steel is taken and drafting room methods are practiced as applied to this work. The names of standard forms of trusses and their construction are discussed. Shop practice as related to timber construction is taken in carpentry, and as related to steel construction in connection with masonry work. During this period visits are made to steel fabricating plants for the purpose of studying methods of production.

During the fourth three months, elementary freehand drawing, isometric drawing and elementary work in shade and shadow are studied.

Stone work and terra cotta are studied in connection with masonry work, while elementary plumbing, heating, electrical installation and gas piping are taken up as related specialties.

The following texts are used in this course:

Architectural Drawing, Edminster; Building Estimator, Hodgson; Building Construction and Superintendence Part 1, Kidder; Building Construction and Superintendence Part 2, Kidder; Architects' and Builders' Pocket Book, Mill Buildings, Ketchum; Bungalows, Camps and Mountain Houses, Comstock; Mechanics' Ready Reference, Plumbers' Edition, Ritchey; Vocational Mathematics, Dooley; Materials and Construction, Pratt; English for Business, Webster.

First Three Months—Twenty Hours Per Week.

Sheets 1, 2, 3, 4 are the same as outlined under Machine Drawing and Design.

5. Tracing of a standard architectural drawing. An interesting problem for this work is the tracing of a drawing of one of the school buildings. If such is not available a blue print should be secured from a local architect.

6. Elements of projection as applied to architectural drawing, models used to be parts of buildings. (1) Front, top and side view of a simple shape without dotted lines; (2) same shape introducing dotted lines, (3) same shape introducing a section; (4) section thru floor and partition as shown on plate No. 79 in Edminster's Architectural Drawing. This sheet taken in connection with study of some parts of school buildings where construction can be seen. Problem showing partition parallel to joists drawn, parts named and the whole fully dimensioned.

7. *Studies in Architectural detail.* The reference plates on sheets Nos. 7, 8, 9, 10 are taken from Edminster's book.

Similar details from other texts can be used as long as the principles involved are included. (1) Section thru water table, plate No. 68; (2) Section thru cornice, plate 69; (3) Window, with sections thru stile, sill and head; (4) a standard four panel door showing details of all joints, and names of all parts. (5) Chimney construction, plate 88; names of all parts, dimensions given, sections drawn and thoroly studied; (6) The standard construction joints, plates 89 and 90; the relative proportions of dimensions of joints studied, in relation to the size of timber spliced and formula worked up for proportions of various joint elements; each joint named and formulae lettered in on sheet. It is assumed that unit No. 7 will require

several large sheets, since all details should be drawn full size according to the practice in this class of work.

8. *Elementary studies in masonry as used in construction* (1) Names of various types of stone bonds; plate 92. (2) The various bonds applying to brickwork;[1] (3) The various arch formations showing dimensions and details of construction; each arch properly named. Unit No. 8 on one sheet, properly balanced to give desired appearance.

9. *Studies in elevation;* plates 80 and 81. This drawing laid out to size as shown in scale of stories calls particular attention to simple method of representing wall finish; underpinning studied; front and side elevations on same sheet.

10. *Framing plans and elevations;* plates 82, 83, 84, and 85. Two sheets under unit No. 10. Each timber used explained; name of each part and purpose. All work carefully laid out to dimensions. From the drawings made up under units 9 and 10 a full bill of material is to be taken off and made up covering construction complete to and including the plastering. No interior trim except door and window casings included in this bill.

Second Three Months—Twenty Hours Per Week.

Steel Building Details—

Sheet No. 1—Each of the following shapes drawn and parts named, as flange, web, bulb, etc.

I-Beam.	H-column
Channel.	Box column.
Z-bar.	Channel and plate column.
T-bar.	Z-bar column.
Bulb beam.	Title. Enter scale used.
Angle-equal	Kidder's Handbook as text.
Angle-unequal	

Sheet No. 2—Enter scale used in each problem.

No. 1. Draw a three-quarter inch bolt, ten inches long according to standard table given in Kidder's. Put in all dimensions for making, and give table of U. S. Std. threads as notes in connection with this problem.

No. 2. Expansion bolt. Draw a five-eighths inch expansion bolt; one as shown in Kidder's handbook. Explain purpose for which used. One of these is movable bolt type, other is movable nut type, and they should be so titled. In connection with this problem study all material in Kidder's handbook relating to the following:

Wire gauges and wire classification.
Estimating weight of wrought iron, steel, cast iron, screws, threads, buts, and bolt heads.
Nails, holding power of nails.
Table of cut steel nails and spikes.
Tacks, sizes, etc.
Steel wire nails, spikes and tacks.
Data on excavating.
Data on estimating cost.
Data on painting.
Data on glass.
Data on roofing.

These data carefully studied and full explanations given.

3. *The proportions of rivets drawn,* and rivet signs, as shown in Kidder's. All notations explained in notes in connection with this problem, e. g., shop rivets;—means, etc. In connection with this problem study following data in Kidder:

Length of rivets; length required to form head.—Sleeve nuts.—Turnbuckles.—Clevice nuts—Steel eye bars.—Upset screw ends.—Specifications for structural steel.

4. *Draw*—Larimer column.—Phoenix column.—Nurick column.—Channel column.—Gray column.

Z-bar with double covers. A side view as well as plan of each column to be drawn. Give scale to which each problem is drawn on this sheet. Study advantages and disadvantages of each type of column. Column connections.

Sheet No. 3—This sheet is devoted to latticed column construction shown in Ketchum's Steel Mill Building. Elementary form, base details; all notation explained as: 2/s $3\frac{1}{2}$x$2\frac{1}{2}$x$\frac{1}{4}$—means:

— three angles $3\frac{1}{2}$x$2\frac{1}{2}$ flanges $\frac{1}{4}$" thick, etc.

Drawing of steel column and connections; all notes explained. Detail of lattice straps.

Drawings of beam connections shown in Cambria and Carnegie handbook; careful explanation of application.

Give scale of each problem.

Sheet No. 4—Drawings of following:

Lateral lug—Ketchum's Mill Building.
Purlin clip—Ketchum's Mill Building.
Corrugated steel—Ketchum's Mill Building.
Fastening corrugated steel to purlins. Ketchum's Mill Building.
Corrugated details, Ketchum's Mill Building.
Anchors, swedge bolts, beam separators, from Carnegie Handbook.

All problems scaled; notes explaining use of each element to appear with each problem.

Sheet No. 5—Devoted to floor construction—Ketchum's Mill Building.

Cement, brick, wood-five types, brick arch floor, corrugated iron arch, expanded metal.

All necessary information for construction of floor to be given on drawing, notes to include specifications.

Scale the drawing.

Sheet No. 6—Drawing of section Steam Eng. Building Brooklyn Navy Yard—Ketchum's Mill Building. All details of this drawing carefully studied and thoroly understood. In connection with this sheet the Cambria and Carnegie Handbooks should be carefully reviewed. From this review the student should gain an understanding of use of these books as applied in practice. Property tables should be carefully analyzed.

Third Three Months—Twenty Hours Per Week.

Sheet No. 1. Drawing of eight panel queen truss of timber type; all joints to be fully detailed showing bolts, thrust pieces and keys. Names of all parts to appear, as "ties", "struts", "tie-beam", purlins, counter braces. The problem in this plate is to be similar to that given in Kidder's handbook, showing roof truss with floor suspended.

Sheet No. 2—Various types of steel trusses from "Steel Mill Buildings", by Ketchum. Various types of Fink trusses for different roof spans. Analysis of truss formation. Drawings of Howe, Hybrid, Pratt, Modified Pratt, Quadrangular and Camel's Back and saw tooth.

Sheets No. 3 *and* 4—Standard Mill construction drawn to scale. Use Kidder's pocketbook as reference. A front and end elevation of a three story mill, together with necessary sections. Building to be of brick and timber, and construction to conform to good practice as outlined in text. Details of all bolts, wall plates, pintles and minor structural features shown in full. Drawings to be freely annotated, and all necessary small detail drawings to be shown.[2]

Lectures on Carpentry.

During the third three months two lectures of 90 minutes each are given on Carpentery practice in heavy construction.

No. 1 deals with the getting out of heavy timber by means of saw mills or broad axe and adz, when mill is not available; use of drift bolts and treenails. Methods of handling heavy construction by means of A frames and gin poles including detailed instructions for setting up these devices.

No. 2—The various knots and hitches used in rigging explained. A sample of each knot shown and the tieing illustrated. Classification of block and tackle given. Reference U. S. A. Engineer's Field Manual. The use of compressed air for drift bolt driving, boring and chipping on heavy construction.

[1] American, English, single Flemish, double Flemish, English cross bond, Dutch, heading, raking, diagonal and herring bone bond.

[2] The remainder of this period is to be devoted to drawing up a complete set of plans, elevations and details of a small modern steel and brick constructed mill. Sketches and notes should first be made and the completed drawings made from these.

Lectures on Masonry.

Four lectures of 90 minutes each devoted to steel skeleton construction and builders' level.

1. Brickwork in skeleton construction. Starting of upper floor walls before ground floors. Construction of various arches in steel skeleton work, with brick.

2. Devoted to skeleton work using terra cotta. Curtain walls and various arch constructions carefully considered. During this period all members of class are to be taught use of builders' level; outline given in two lectures.

Fourth Three Months—Twenty Hours Per Week.
Drawing Room Practice.

Preceding or during this period the student should be given photographic practice including camera setting and development of plates and prints.

Text: "Bungalows, Camps and Mountain Houses", Comstock.

One sheet in pencil reproducing single room cabin at Chappaquiddick, Mass.

One sheet in pen and ink, reproducing a mountain lodge.

One sheet in pen and ink, reproducing log camp in Blue Ridge Mountains, Va.

One sheet of water color wash reproducing a California bungalow. Roof in red, walls in gray, perigola in white, lawn and foliage green, walk white, window trim green. Note shading carefully. The remainder of period is devoted to design of a six-room bungalow, having modern conveniences.

See "Radford's Building Details" for kitchen and closet conveniences. Get out full bill of materials and all specifications, including heating and plumbing. The drawings, in addition to plans and elevation, are to include an isometric view of the house. Full size interior details made for trim. In design of gas piping, heating, plumbing and roofing, consult "Mechanics Ready Reference", by Ritchey.

The house is to be wired for electricity as well as supplied with gas service. Consult Kidder on electrical installation.

Related Work—Carpentry.

First Six Months—Six Hours Per Week.

Text: Building Construction and Superintendence, Kidder.

Chapter 1—in full. Woods.[3]
Chapter 2—in full. Frame Construction.
Chapter 3—in full. Windows, etc.
Chapter 4—in full. Outside finish.
Chapter 5—in full. Interior woodwork.

Chapter 6—Take material dealing with following: nails, screws, leg screws, stove bolts, hinges, butts, double acting springs, locks, bolts, transom fixtures, window and drawer fittings, cupboard fittings. All standards should be understood and trade specifications carefully studied. Parts of this chapter not mentioned are omitted.

Elementary Estimating—Two Hours Per Week.

Text: Building Estimator, Arthur.

All of Part I of this book is to be studied. As an exercise the estimate for house drawn as a drafting project is to be worked up, using full bill of material, and giving a price bid for the job. At close of work student is given one week of general jobbing in order to develop an elementary knowledge of carpenter's tools.

Masonry—Five Hours Per Week.

Text: Building Construction and Superintendence, Kidder.

Chapter 1—Foundations to P. 14.[3]
Chapter 1—P 23, take superintendence.

[3]The text should be studied in the carpenter shop classroom where the student can have free access to the work going on in that department.

Chapter 3—Masonry Footings to top of P 95; Begin P 96. Foundation Walls, to P 123.

Chapter 4—Limes, etc. Begin top P 128. Omit Art. 147, Begin P 129 to top of P 137, taking up characteristics of good lime. Begin P 161, Portland Cement to top P 165, Begin P 171 to bottom P 175. Begin P 188, cement mortars, to top P 202.

Chapter 5—Begin P 213 on granite to top of P 216. Begin bottom P 226, end middle P 227. Begin P 236, Sandstones, stop P 243.

Chapter 7—Bricks, to bottom P 342. Begin P 348, end P 383, Begin P 403 at inspection.

Chapter 8—Terra Cotta to bottom P 422.

At close of work student is given one short wall three feet high in American bond, to develop elementary knowledge of bricklayer's tools.

Carpentry.

Second Six Months—Six Hours Per Week.

Text: Building Construction and Superintendence, Part II, Kidder.

Study of interior trim; adaption of elements such as doors, casings, wainscoat, moldings, etc., to trim. Attachment of trim in building. During this period the following shop projects are carried out:

A flat miter joint.
A standing miter joint.
Mortise and tenon joint.

A piece to be run with bevel, rabate, chamfer and stop chamfer. See Kidder's text under Moldings. Each student to build the following project: Section of a house approximately four feet long, with joists, studs, sill rough and finished floor, sheathing, etc. Suggested problem: Corner of a frame building directly above the foundation wall.

After being lathed and plastered the finish should be placed using a tongue and groove joint for the base board on the inside corner. Mouldings should be coped.

Estimating.

Second Six Months—Two Hours Per Week.

The work during this period is related entirely to steel work, Chapter 13, Arthur's Estimating. As a study an estimate is to be made on Brooklyn Navy Yard building. Drawings for this building form a part of the work in drawing room practice during this period.

Masonry.

Second Six Months—Five Hours Per Week.

Text: Building Construction and Superintendence, Part I.

Chapter 6—taken in full.
Chapter 9—taken in full.
Chapter 10—taken in full.

Complicated stress diagrams, and advanced mathematics omitted. During this period the student should lay up a double ro-lock arch with necessary supporting piers. The project built in the carpenter shop is to be properly plastered.

English—Two Hours Per Week. The aim of this work, thruout the course, is to give power of expression in speaking and writing. The student should be able to converse readily and intelligently on commonplace subjects, using good English in so doing. Webster's "English for Business", is used as a text.

Mathematics—Five hours per week. Dooley's "Vocational Mathematics", which treats of the practical application of mathematics, is used as a text. Supplementary material is introduced as it is necesary. The instruction should be individual.

Strength of Materials—Four hours per week. The work follows very closely the material presented in Pratt's "Materials and Construction." Supplementary material is introduced as the student finds use for it in work in design in the drawing room.

An Itinerant School for Painters and Decorators

J. V. Lynn, State Supervisor Trade and Industrial Education, Des Moines, Iowa

THE short course during the dull season in the painting trade is not a new idea. It was advocated by members of the National Association of Master Painters some years ago, and attempts were made in a number of states of the Middle West as a result of that advocacy. The Engineering Extension Division of Iowa State College at Ames, in cooperation with the State Master Painters' Association, was quite active for four years previous to the world war, conducting courses in well distributed centers of the state. These were of necessity discontinued with the entrance of the United States into the great conflict.

As in all promotional efforts, it was essential that the courses be short, intensive, taught by highly specialized instructors, and popularized thru much advertisement and the use of competitive devices, such as prizes for the best progress and demonstration of ability. Notwithstanding all this the attendance was small, but the testimony of those who did take the course was the real advertisement desired. It was cumulative, and really bore much fruit in a subsequent attempt to reopen the work after the close of the war.

The attempt became a legitimate part of the program of vocational education under federal encouragement, and the State Board for Vocational Education was interested in the problem of rejuvenation on an entirely new basis of organization. It meant several vital changes in method and policy. First, the local school boards in the respective cities must assume the responsibility of conducting the courses formerly carried on by the state institution. Second, the course, being classified as a part-time short-course under the federal act, must be expanded from a ten-day unit to a minimum of 144 hours, or eighteen days at eight hours per day. Third, the course can not be opened to citizens other than those already engaged in the trade, or young men having at the time of enrollment a written contract of employment to begin at the close of the course. And, fourth, a new arrangement for provision of tools and consumable supplies must be provided.

The purpose of this article is not so much to describe what was done during the winter of 1919-1920, as to analyze the results of the venture. Before doing so, however, it will be necessary to outline the nature of the activity.

A committee on education, appointed by the State Master Painters' Association collaborated most effectively in selecting centers of operation, finding acceptable teachers, arranging for local committees of master painters and journeymen to assist the school boards in advertising and conducting the course, and in passing upon the effectiveness of the syllabus to be offered.

Three phases of the trade, each lasting for a week, were approved and three instructors, each a specialist in his line, were engaged. The first week covered the fundamentals of preparation of walls, mixing of paints and practice in color mixing, applied chemistry of paints, spirits and oils, and care of tools. The second week was devoted to paper hanging and wood finishing. The third was spent in the more advanced decorative work, such as blending, stippling, stencilling, marbling, lining, cornice and fresco work. In order that the appeal might be made most attractive it was advertised that men enroll for any one, any two, or all three weeks as desired. It was recognized that this would materially lower the percentage of attendance in considering the full course as the unit, but the privilege attracted more men and thus dispersed the knowledge of its value more widely.

The course was originally offered to six cities. Four availed themselves of it, and a fifth, not at first included, was arranged for during the progress of the others. Marshalltown, Waterloo, Mason City and Sioux City completed the course as per schedule, but Burlington, wisely decided to postpone its course until next winter on account of an early opening of the working season. Six weeks were therefore required to complete the series, the first opening January 12th and the fourth closing February 21st.

Statistics on enrollment, attendance and cost of instruction are as follows:

Total enrollment	119
First week enrollment	67
Second week enrollment	93
Third week enrollment	51
Enrolled for first week only	12
Enrolled for second week only	27
Enrolled for third week only	11
Enrolled first and second weeks only	27
Enrolled second and third weeks only	14
Enrolled first and third weeks only	1
Enrolled for all three weeks	25
Total attendance	904
Average daily attendance	12.5
Percentage of total possible attendance	42
Percentage of first week possible attendance	75
Percentage of second week possible attendance	63
Percentage of third week possible attendance	82
Total cost of instruction, not including supplies	$1,020.00
Cost of instruction per man per day	1.13

A study of the attendance reveals some interesting points tho this cannot be assumed to constitute sole reasons for the conclusions. First let it be understood that the quality of instruction was equally good in all three weeks, and that personality of the instructor was not an element in any degree apparent.

In general it may be stated that smaller cities gave a better response than larger ones, and that in one of the larger cities the personnel was mostly of men from outside points, men who take contracts and do all or a portion of their own work. A considerable number of the men wanted paper hanging in any event, whether they took fundamental or advanced painting, tho the number taking all three was surprisingly large.

Enrollment for the third week was smallest but the

rate of attendance was highest. In visiting classes one discovered that many of these men were contracting workmen from out-of-town points. Interest and attitude were particularly good. One man, a journeyman, took the full course in one city and followed the series in two other cities for two extra weeks of work in decorating. He literally discovered himself. Another, a contractor from out-of-town, unable to get the full course in one city, went to another to get the third week's work.

CLASS OF PAPER HANGERS AT MARSHALLTOWN, IA.

The percentage of possible attendance by weeks was considerably larger than the percentage for the full course. As explained above, this was due to the liberty of enrollment by weeks if desired.

In addition to the day classes, there was offered an evening unit-course on Special Methods and Treatments. Each instructor gave two evenings to this course. It developed largely into a question box and free discussion method, and the result was satisfactory in all but enrollment. It was requested by the trade on the ground that many men employed thru the day would be able to take advantage of the evening course at least. The registers showed, however, that the evening enrollment was not any larger nor materially different in personnel from that of the day class.

One must take into consideration the existence and duration of a dull season in the painting and decorating trade before organizing such a course in any given district. It may already have been observed that the cities which conducted satisfactory courses all lie in the northern half of the state and that the only southern city had to forego its course on account of not having sufficient dull season to guarantee attendance to the end of February. Indeed, even in the northern cities there was a great deal of work going on, and men frequently had to withdraw to execute some needed work.

On the whole there is every reason for considering the program a successful one from a promotional standpoint. In carrying the mountain to Mahomet we reached a much larger constituency. Men in attendance are unanimously in support of the worth of instruction offered, and these being widely distributed are good advertisers for the policy of school training in the trade. The enrollment was very much larger than had such a course been offered in one central place such as at Iowa State College at Ames. In addition to this, there is also an opportunity to demonstrate to employers that it is worth their while to arrange current contracts so that men may have opportunity to attend the local class. The employer can visit the school frequently and see what is being done. As a result of this we have on file testimonials signed by both employers and employees who attended the classes. Inertia is the most troublesome obstacle we have.

On the other hand, while we have reached more men, and shall continue to offer such work on the itinerant plan for some time yet, we find it expedient to adopt a more efficient program as soon as it is feasible to do so. There are three objections to the itinerant school. In the matter of salaries it is evident that the instructional cost must be excessive. It is also difficult to house a class satisfactorily. School boards do not always have available rooms, and most rooms, whether in a school or other building need temporary structures to work upon, because the walls cannot be used for this purpose, nor can sheathing and wall board be attached to them as a usual thing. The third unsatisfactory element is the matter of tools, consumable supplies and their storage. There is difficulty in providing tools in quantity and quality for so short a course, and the

State Board for Vocational Education cannot use funds to supply such and transport them from city to city. Paints, oils, and so forth are left over in excessive amounts, and there is difficulty in disposing of them.

Difficulties in making preliminary arrangements prevented the opening of the series until January 12th, but in future there seems to be no reason why the series cannot begin in December so that six centers at least may be visited before the end of February, taking the southern cities early in the series.

At the last convention of Master Painters and Decorators, the problem of education was vigorously discussed the greater part of an afternoon. The merits of a systematic apprenticeship, including public school training on a part-time trade extension basis for four or more hours per week thruout the school year, were favorably received. This plan would apply only to cities where twelve or more apprentices could be provided. For all places of lesser size it seemed that a unit trade class might be established in the non-collegiate division of Iowa State College, to which boys could be sent for a year. At the same time this institution should provide short courses of a week or more during the winter when journeymen of the state might get special training on any phase of the work desired. The Association has had such a centralized program under consideration for some time, and it is ready to adopt a forward movement just as soon as it can be assured of statewide support on the part of the trade. The part-time program requires more promotion, since it involves an apprenticeship system, the organization of which entails many subsidiary conditions.

The feature to be kept in mind, however, is that the state association has a real educational objective, and all its efforts at present are promotional. The cost of this promotion cannot be considered excessive in the event that thru it we attain our desire.

THE MAKING OF PLASTICINE MODELS

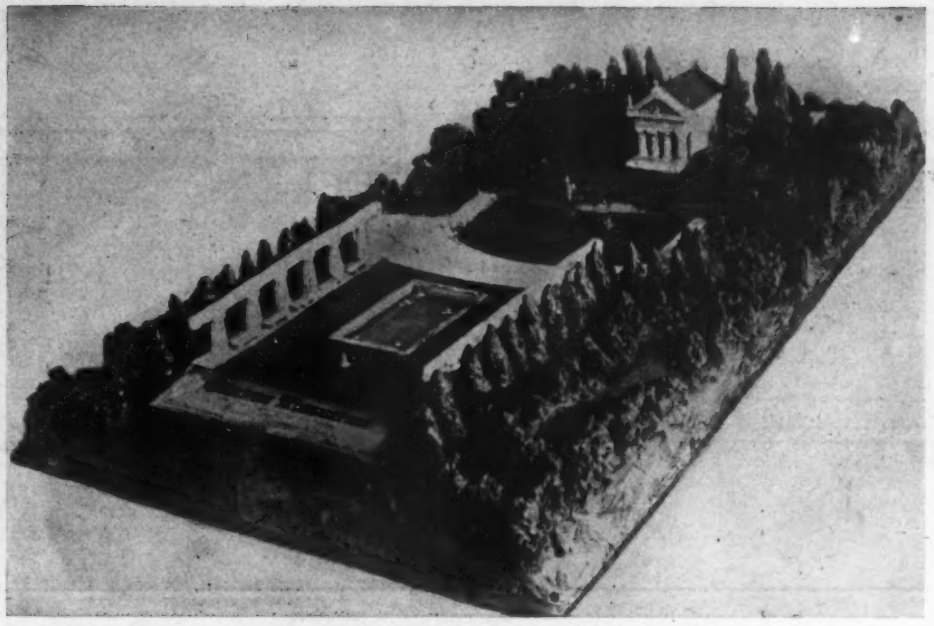
Lucy Lowe, Urbana, Ill.

THE making of plasticine models is a comparatively new side line of the field of modeling. One of the largest universities in the country, the University of Illinois, in connection with its professional course in landscape gardening, has found it practicable to conduct a class in this work, owing to its present usefulness in presenting landscape schemes to clients. The material used is a sort of clay treated with vaseline which goes under the trade name of plasticine. This clay comes in various colors, altho for the most part only the standard colors, red, blue, yellow and a gray-green, are used. Whenever it is desired to use more delicate shades, they are created by combining shades of clay, by the use of pastels mixed with the clay or by applying water color paints which are later sprayed with varnish.

The work done at the University of Illinois has had to do, for the most part, with the modeling of civic improvements, home ground sites, country estates, large and small, and with period garden types. There is, however, practically no limit to the various types of construction that can be represented thru this medium.

The chief utensils for the work are the regular modeling tools, plus such commonplace instruments as hairpins, very fine meshed wire netting, cardboard, glass, sponges which are cut and dyed to make trees, and most important of all, the ten fingers of the designer. The plan is drawn up to scale, then traced onto cardboard, or if it is preferred, the tracing paper is simply pasted to the cardboard or glass, whichever may make the foundation for the work. Upon this is laid a flat groundwork of the green clay, and the design is built up from this in whatever colors may be needed.

A JAPANESE GARDEN. MODEL WORKED OUT IN PLASTICINE.



PLASTICINE MODEL OF A GARDEN THEATER.

One of the designs made by the students at Illinois was of an Italian garden theater. In this model, because most of the planting was evergreen in character, it seemed best to use the clay for trees, shaping it to form, rather than cutting sponges of evergreen shape. It was desired to secure a brilliant white color for the temple and for the steps leading to the terrace. No medium of the clay seemed to just fit, but by experimenting it was found that by mixing white chalk dust with the clay, then painting it over with white, the proper brilliancy was secured. The green was too gray a color, and it was treated with pastels to secure a deeper tint, and finally, the whole model was sprayed with varnish, giving it a peculiar brilliancy which made it really beautiful. This is one of the illustrations shown.

The other illustration shows a small Japanese garden, the stepping stones of which are made of tiny pebbles, the temples of clay covered cardboard, the fence of tiny strips of palmleaf fan, the trees of dyed sponges, and the water is indicated by glass-covered blue crepe paper.

The models are not hard to make and are much in vogue just at present among architects, and city planners, as well as garden architects. They are particularly useful for window display in arousing popular sentiment for the carrying on of municipal improvement, and among architects and garden designers, for clients who do not read plans. Many offices are willing to pay rather well for the making of such models, for use in cases such as this, usually preferring to have them made by help outside the office rather than taking the time of a draftsman for this work.

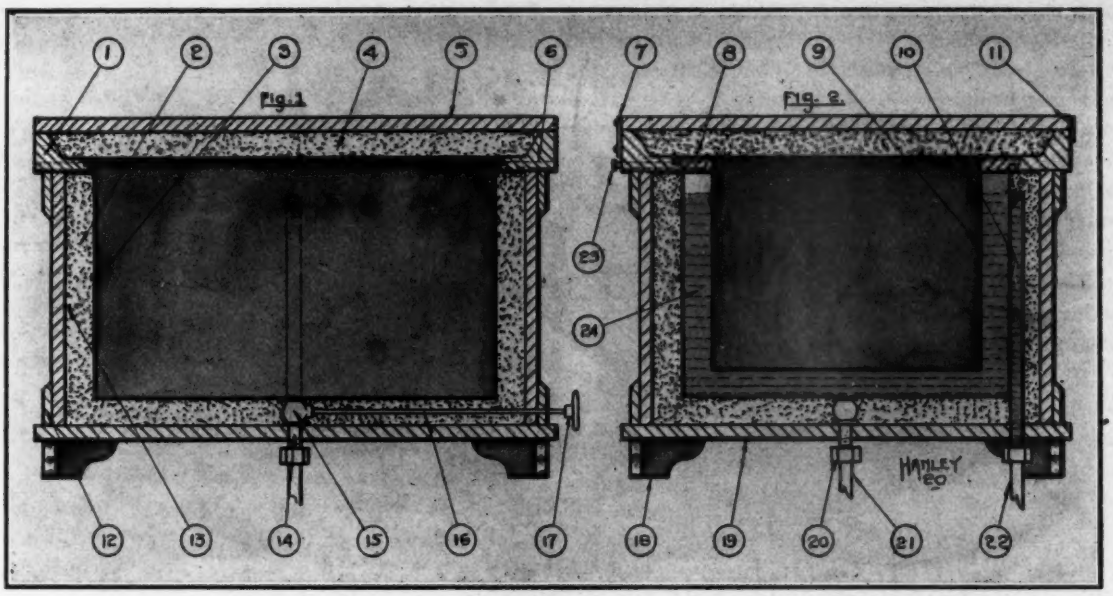
A CONVERTIBLE ICE-BOX

Edmund C. Hanley, Hackley Manual Training School, Muskegon, Michigan.

DURING the summer months probably nothing receives so much attention and worry by the housewife as the problem of caring for the perishable foods. It is imperative that the milk, the butter and meats, and other perishable foods be kept in a cool place during the warm weather. Never before did this problem worry the mother as it does right now during this present period of unheard prices. Like everything else the price of ice has gone skyward while the cost of refrigerators will place many a home without one this season.

One of the oldest and most common practices used where ice is not taken during the summer months is to place the milk bottles and other foods in a pail and allowed them to stand under a slow stream of running water. If this practice is employed in the home and found satisfactory the results of the cooler described in this article will be found most satisfactory. The writer experimented with such a box last summer and the results were found most interesting. A thermometer was kept in the inner chamber and daily readings taken. The readings showed the temperature of the box to vary from 48 to 60 degrees.

An interesting fact was that on some of the warmest days the temperature of the cooler was coldest. The fact that the cooler may be converted into an ice-box



Figs. 1 and 2.

by merely removing four pins and lifting out the small pan and disconnecting the intake hose make the cooler most practical. Its value is further increased as the box may also be used as a warming oven or converted into a fireless cooker as will be noted later.

The Cooler—The food is placed in a metal pan which is supported from a wooden frame. This pan is located central in another metal pan in which water is allowed to circulate around the smaller pan. After the water has been allowed to circulate for a while the temperature of the inner compartment will equalize with that of the water. If the water is then shut off and box kept closed, the temperature of the cooler will be found to remain almost constant for several hours due to the nonconductor wall surrounding the water chamber. Unless the small pan is pinned down it will float as soon as the water is turned on. The construction of the cooler might better be understood if we will refer to Figure 2, which shows a cross section of the cooler. The water enters thru hose connection detail No. 21 and circulates around pan No. 9 and passes out thru overflow pipe No. 10. It is planned to have the water come from the basement and the hose concealed by passing thru two holes in the floor under the box. The regulating of the water might be most conveniently arranged by placing a stop cock No. 15 as noted in Fig. 1, and regulated by an outside hand wheel No. 17.

The Ice-Box—Should the water become too warm during the summer months to keep the foods in good condition the inside pan may be lifted out by first withdrawing the four pins No. 23. A small cake of ice may then be set in this compartment and the ice as it melts allowed to pass off thru the intake hose which will now have to be disconnected in the basement and placed so that the water may pass off in the basement sink.

The Warming Oven—During the winter months or, at any time an extra warming oven is needed, the box is again converted as a cooler but the hose in the basement is shifted over to the hot water faucet, and the operation repeated as in the case of the cooler.

The Fireless Cooker—The box may now be converted into a fireless cooker by preparing five pads that will fit snugly between the pans. These pads may be built satisfactorily of corrugated cardboard and filled with any of the nonconductor materials as noted elsewhere. In filling the pads they should be held rigidly between boards to keep the sides from bulging.

Before attempting to build the box it should be drawn up to scale and designed to meet your requirements. The following suggestions might be helpful:

1. Have the inside pan deep enough to accommodate large size milk bottles.
2. Allow 1½″ between the pans for water to circulate.
3. Allow 1½″ between the large pan and the box for the sawdust, etc.
4. All inside wood parts should be protected with paraffine coating to prevent parts from warping.
5. Design the box of convenient height that it may be used as a kitchen seat.
6. Have an opening and cover in the bottom to allow for filling the box with a nonconductor material.
7. If the box is to be finished in white enamel any soft wood will be suitable to use.
8. A soap stone of convenient size will be required if the box is to be converted into a fireless cooker.

Details of Convertible Ice-Box, Cooler, Warming Oven, and Fireless Cooker.

Fig. 1 shows a front elevation converted as an ice box, Fig. 2 an end elevation converted as a cooler or warming oven, the sectional isometric shows the box converted into a fireless cooker.

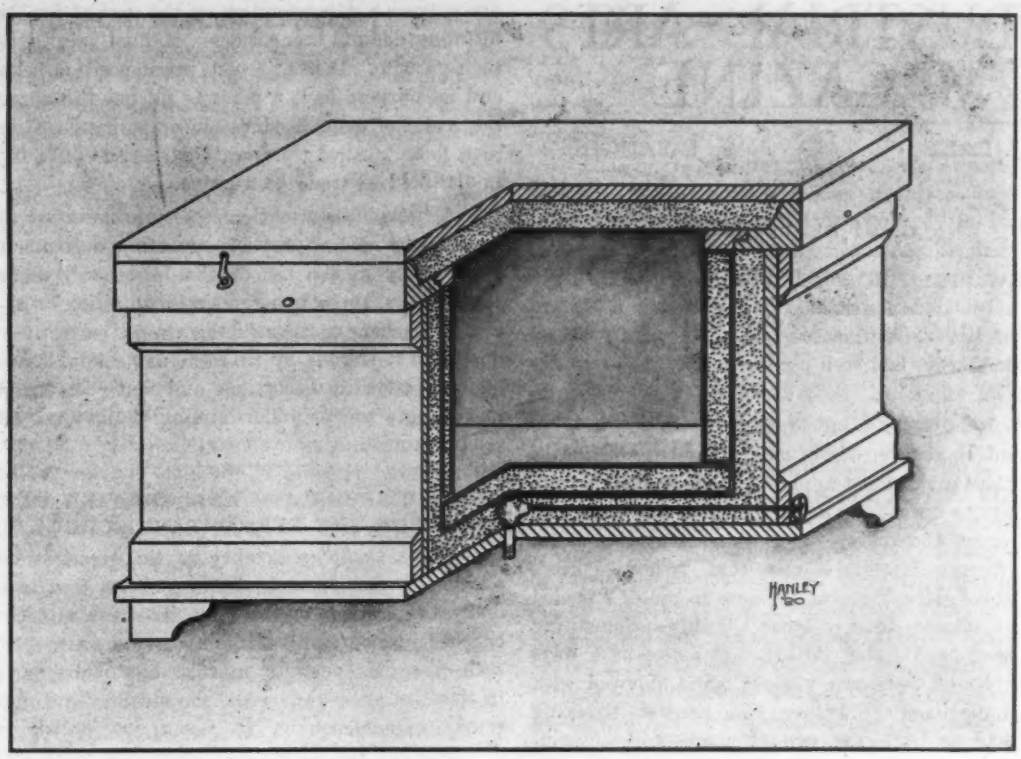


Fig. 3. Perspective and Section.

Details of fig. 1 and 2.

1. Top frame of box, four pieces required; each piece rabbeted on the inside edge; sides and end pieces joined with tongue and groove.
2. A nonconductor wall composed of saw dust, cork, steel wool, pieces of felt, charcoal, etc.
3. A large metal box constructed of galvanized sheet iron; this box is supported from frame detail 1.
4. Cover pad made of galvanized sheet iron, filled with same material as detail 2.
5. A wood cover, strengthened with wood cleats at each end. Pad, detail 4, fastened central on under side.
6. One-quarter inch hole for metal pin, bore four holes in place.
7. Cover latch, brass, two required.
8. Frame to support inside box, four pieces required, each piece rabbeted to match frame detail 1, each piece mitred and joined with a spline.
9. Small pan, galvanized sheet iron.
10. Overflow pipe, use 1 inch brass pipe, mitre at one end and solder pieces together to form an elbow. Cut a corresponding hole central and about 1 inch from the top edge of large metal pan and solder in place. A hose connection and coupling should be soldered to the other end.
11. Butt hinges, three required.
12. Moulding ½ inch stock, bevel one edge and mitre corners.
13. Sides and ends, rabbet corners.
14. Brass hose connection, two required.
15. Stop cock.
16. Stop cock extension arm.
17. Regulating hand wheel.
18. Feet, four required.
19. Bottom, construct with a removable bottom.
20. Coupling nut for hose, four required.
21. Intake hose.
22. Outlet hose.
23. Removable lock pins, ¼ inch brass, four required.
24. Circulating water.

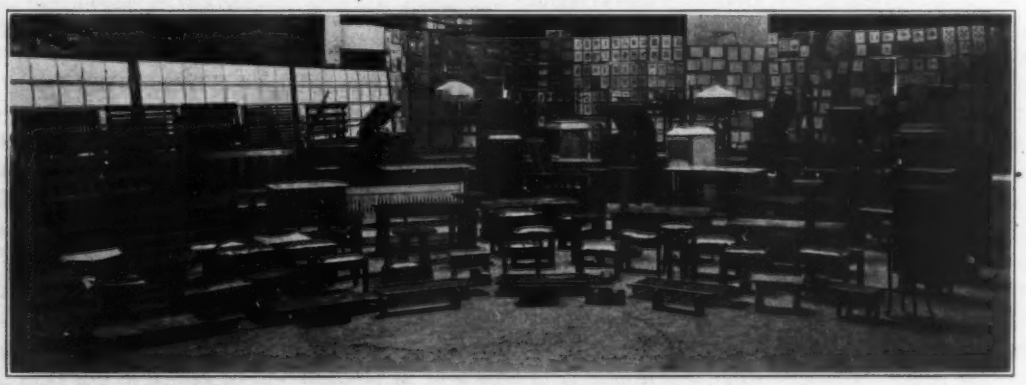


Exhibit of Manual Training Products at Winfield.
Mr. L. H. Alberty, director.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

A NEW FIELD FOR VOCATIONAL ENGLISH.

The coal strike was on. The mines of a certain section of Illinois were closed. In these mines, several foreign languages had been used almost to the exclusion of English.

When the order came to open the mines, a large number of English speaking men presented themselves for work. Many of them were given jobs as mule drivers in the various operations in which mules are used. To their dismay, the drivers soon found that the mules "used" foreign languages and that "whoa," "gee," "haw," and "get up" meant no more to mules schooled in foreign tongues than so much Choctaw. Something had to be done, for they do say that mules have ways and troubles of their own without being annoyed with speech impediments. Either the English speaking drivers had to learn the various expressions of command, threat, cajolement, and terms of endearment in Italian, Austrian, Finnish, etc., or else the mules had to be taught the English equivalents of such expressions.

The report does not state which plan was adopted, but having faith in the loyal and patriotic impulses of the new drivers, we hazard the guess that the mules were given a thoro course in vocational English in compulsory part time or evening classes.

ARE YOUR COURSES VOCATIONAL?

There is still a surprising looseness in the use of the terminology of practical education. Not that mere terminology is the most important thing in the world, but it does seem highly important and desirable that when one speaks of a certain field of education in the terminology of that field he should convey a perfectly definite and uniform idea to those who hear him.

It seems that when people want to get away from certain theories and practices, they first fall upon a new name with which to designate the old practice and then proceed happily for a time in the same old way under the guise of a new nomenclature.

A good deal of old-fashioned manual training is now being done under the name of vocational education. Multitudes of people are ready to dub any sort of work that is done in a shop as "vocational education." Some teachers have deliberately taken the latter term for their work in order to break away from certain unhappy associations with the work commonly called manual training.

It is the prime purpose of vocational education to give specific training for wage earning occupations. It presupposes a determination on the part of the students to follow definite occupations. Manual training has no such purpose. It has no such presupposition. Its work and its purpose have a place to fill but this place is in the realm of general education or perhaps in what has been loosely called "prevocational education"; it is not in the field of trade instruction.

A little more attention to certain necessary distinctions in the field of practical education, a greater degree of accuracy in the use of the fairly well established terminology, and a more general disposition on the part of the teachers to classify their work correctly and to designate it frankly by its right name would save endless confusion in discussions and would materially aid in getting a proper understanding of the work into the public mind.

LESS ARTIFICIALITY AND GREATER VARIETY FOR THE ELEMENTARY SCHOOL.

There is an artificiality in the arrangement and conduct of most manual training shops that is almost distressing. Usually there are the rows of nice little benches just so many inches from the walls and from each other; the perfectly uniform sets of tools arranged in specified order; and often the uniform and inflexible courses of models.

Perhaps this uniformity meets a condition and a need. Perhaps the orderly arrangement does have some wholesome influences upon the boys. But how perfectly deadening uniformity and orderly arrangement may become unless the monotony is broken up in some way!

We are disposed to predict the coming of the all-purpose shop for the elementary school. We hope the time is not far distant when various materials and lines of work will find their way into the elementary school shop. We doubt whether anyone can justify three years of woodworking in the elementary school. Woodworking represented by the courses of small models which have been so generally required in the sixth grade should be forthwith abandoned. There is a place and there is a perfectly limitless need for such work as printing, electrical work, simple pattern work, sheet metal work, simple forge work, etc., in the elementary school.

If elementary work along the lines mentioned should find its way into the elementary school shop, the artificial arrangement, the unyielding uniformity, and the monotony of procedure would of necessity give way to the less uniform but more business-like and interesting work of getting real jobs done in the realms in which boy interests lie. More actual contact with real types of industrial work, more outlook upon the economic and social aspects of the jobs which men do, more information concerning the possibility and desirability of entering skilled trades, and a greater appreciation of the world of industry and of the beauty and use and value of its products will be gained in this than in any other way.

WHAT SHALL WE TEACH?

When the proposition of industrial and vocational education was first given emphasis and it was proposed by some to organize industrial schools independent of the schools devoted to general public education, school officials wisely opposed separate institutions as undemocratic and tending toward class distinction.

As industrial and vocational education within the common school organization is becoming established, the school officials are fearful of the dominance of interest for these subjects and the consequent neglect of cultural study. The arguments against separate schools for academic and industrial training are well taken.

The arguments for a restriction of industrial and vocational study on the ground that it is "dangerously attractive" are not well taken. The problem of what may be best offered for study is properly based on the consideration of what should be learned to fit the individual to serve as a useful and happy citizen of his commonwealth. The problem of development of the individual is based on methods of instruction to develop the individual faculties.

Some certain fundamental subject matter must be acquired by all; some certain degree of skill must be acquired by all; but beyond these very practical necessities no one subject is essential to the development of the finest type of citizen.

Who will venture to name one school subject that must be carried beyond its application by the individual to his relations with his fellow citizen in order to effect culture or even to effect cultivation?

Cultivation of the individual is accomplished by response to a subject of study. Response can only be cultivated thru interest. Interest can only be established by methods of instruction and personality of the instructor. We surmise that the fascination of industrial and trade study is largely a response to the incentive of doing something tangible, and evidently profitable.

Every school subject must be made tangible, and evidently profitable or it cannot be sustained as a school subject.

We may lament the apparent tendency of youth to elect that effort which brings the most immediate returns but unless we can develop a wider vision our lamentations are in vain.

VISUALIZED AND UNIFIED.

One element of the change in prospect for school methods of instruction is in the direction of making the subject matter more graphical and real. We are informed of a series of texts in preparation by one publisher, in which geographical and geological conditions are presented with such graphical effect by relief maps and sections that the child of the primary grades may observe and verify the production of each region from the topography and composition of the soil.

One other change in subject matter that is represented by recent publications is the unification of mathematics so that the calculations of most value in arithmetic, algebra, and trigonometry are brought together and related under a single course of study. These changes are in the direction of visualization and unification that may offer some relief from the elaborate curriculum.

That there are too many unrelated subjects of study in our schools is readily understood. The interests are so diversified that the study is superficial and confusing. To be sure, each subject contains more or less valuable material, but this material is often presented thru a prejudice for its value which retains material that might be reduced and related to other subjects.

No change in school work has more of promise than the formulation of texts that relate and combine the essentials of different subjects.

QUANTITY PRODUCTION MODIFIES COURSES.

THE idea of production in vocational education is making some radical changes in the teachers' attitude and plans of work. Almost invariably, teachers have approached the task of shop instruction with perfectly definite and unyielding courses. The emphasis which has been placed upon production seems not to have conformed to the teachers' courses. Curiously enough, the productive jobs do not come in the exact order specified by the courses of study prepared in advance for the work.

Some recent investigations indicate that many of the progressive teachers are convinced that the purposes of the work may be more fully met and that the principles of the trade may be more adequately and convincingly presented in connection with the real production job than by means of an unyielding list of processes to be performed. In other words, work on a production basis begins with the job to be done and relates the principles and practices of the trade to the immediate requirements of the task in hand. This method puts the work on that real and substantial basis which the shop instructor has been so slow to recognize.

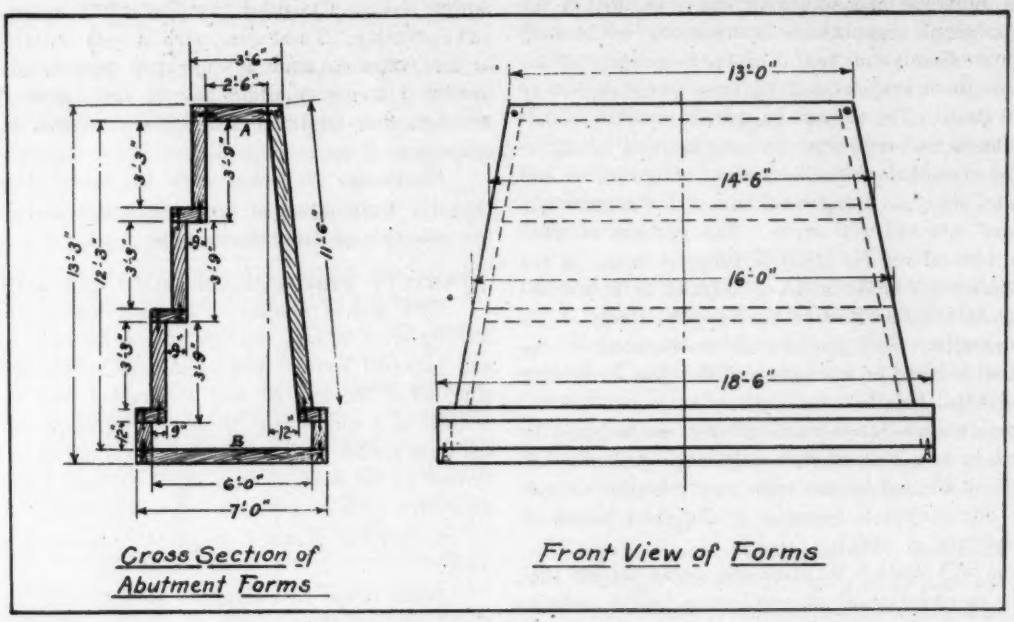
In connection with this method of teaching vocational work on the production basis, the teacher-tradesman recalls his own experience in learning his trade. He probably learned it in the very real struggle of trying to get a real job done in a reasonable length of time. The principles and processes that were abstracted from the real jobs and given for their own sakes probably had but little influence in the development of the tradesman. It is also true that in taking the jobs as they come in commercial work there are certain problems that arise out of the very exigencies of filling an order and meeting an immediate requirement that cannot be foreseen and provided for in a definitely pre-arranged course. So, the teachers that have been facing these problems in the vocational work have wisely clung to the essence of their courses but have discarded the form and the order of their presentation; and what is more encouraging, they have convinced themselves that fully as good, if not better, results may be secured by the modified plan.

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.



Details of Forms for Casting Bridge Abutments.

MODEL FOOT-BRIDGE WITH CONCRETE ABUTMENTS.

Leon H. Baxter, St. Johnsbury, Vt.

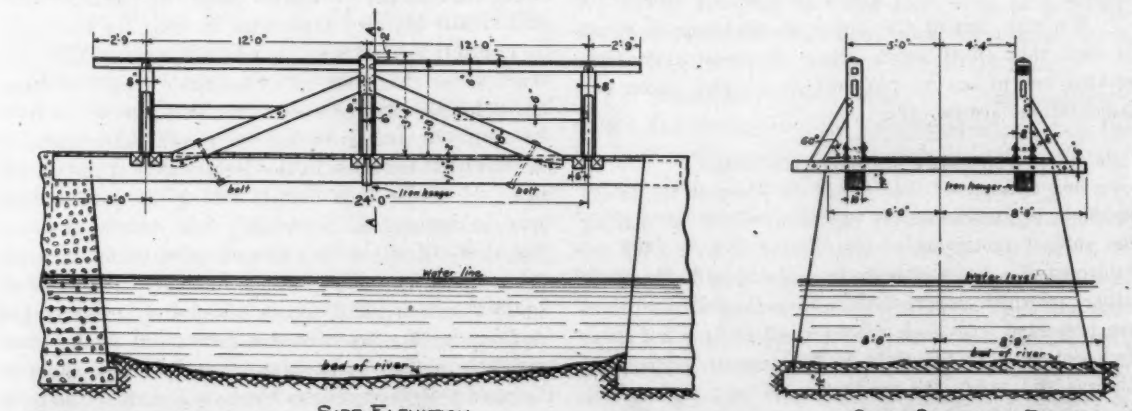
This interesting problem has been worked out a number of times in our junior high school classes to a scale of 1"-1'.

It brings in an interesting study of light bridge construction, a variety of joinery and the preparation and casting of small concrete forms.

We have usually made our woodwork of spruce carefully cut to size, properly joined and secured with brads in proportion to the size of the lumber.

As the construction is self-explanatory in the drawing but little further reference need be made to this part of the work. The forms for the ends must be carefully made of spruce or pine, due allowance being made for receiving the two main girders. This recess can be taken care of by securing a block of wood a trifle larger than the ends of the girders to the inside of the completed form.

In the sectional drawing of the form the top is shown covered, allowing the form to be tipped and filled from one end. In a small model of this type this would be permissible so as to insure filling every cornice and angle in a satisfactory manner. In a full size form, of course, the pouring would be from the top. Cut some pieces of wire mesh to use as reinforcing.



Section thru Concrete Abutments
Proportions of one part cement, two parts clean sand and four parts broken stone.

SIDE ELEVATION

Joinery
All joints are mortise and tenon and are secured by wooden pins.

CROSS SECTION OF BRIDGE AT A-A

Details of Model Bridge.

The cement should be mixed first with the sifted sand until of even color. It should then be cupped out and water added, preferably with a sprinkler can. After this has been turned back and forth until thoroly moistened and about as thick as heavy cream, broken stone, which has been wet down beforehand, is added and the mass again mixed until all the gravel is thoroly coated.

Mixing should be done on a tongued and grooved mixing platform about four feet square with a rim of 1"x2" around the edge to retain moisture on the board. Use a No. 3 square nosed shovel.

Place an inch or two of concrete in form, working it in with a stick, then add the reinforcing wire strips and finish filling. Smooth exposed end with trowel.

Some prefer to paint the inside of the form with one or two coats of linseed oil to prevent the concrete from sticking to the sides.

Leave in form for two days at least and then carefully remove and cast the second abutment.

Two forms may be made and all casting done at once, but if the same form is used for both ends they are quite sure of being alike, and it also saves material.

Any bad places in the concrete surface may now be touched up and the girders and bridgework (which have previously been assembled) put in place.

A rather pleasing effect was obtained by constructing a view-box for the bridge with a metal tank and the bridge set up in this with the piers in the water, and a gravel road graded up to the ends of the bridge. The rear and side of box were painted to represent trees and landscape, and sand was placed in the improvised stream with moss and rushes growing along the edge.

A USEFUL ARTICLE FOR THE KINDERGARTEN.

H. R. Porter, Ellensburg, Wash.

We don't insist that anyone agree with us on the name, "Kiddie Kanter," but it was the best that could be devised on the spur of the moment for this hybrid rocking-horse-teeter. At any rate it has proved popular with the little folk of the kindergarten for whom it was designed. Painted in red, white and blue it adds a pleasant touch of color to their room and at playtime is never idle. Full inch lumber (white pine in this case) was used thruout.

ROCKING-HORSE-TEETER-TOTTER IN USE AT THE NORMAL PRACTICE SCHOOL, ELLENSBURG, WASH.

A MECHANICAL DRAWING TABLE.

G. A. Raeth, Greeley, Colo.

The mechanical drawing table illustrated on this page was designed in the mechanical drawing department of the Greeley High School and was constructed in the manual training shops.

The construction of the table is simple, yet rigid in parts to withstand hard usage. All parts are made of oak, except the top, which is soft white pine. The top is placed upon short pegs which are fastened to the cross pieces. This mode of fastening makes it easy to remove the top whenever necessary, especially for planing and refinishing.

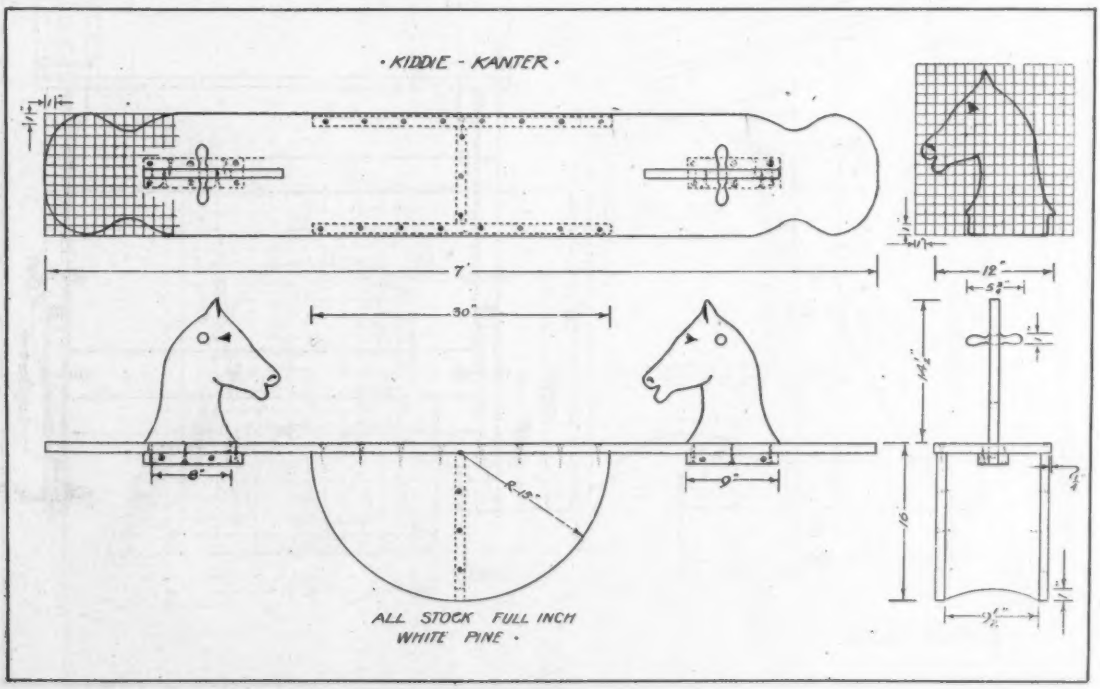
To keep the top from twisting and warping, two cleats are fastened on the under side by means of screws.

In mechanical drawing it is not necessary to have the strip (as shown in the photograph) along one edge of the top, for the same interferes with the head of the T-square.

TO PREVENT STAINING THE HANDS IN MACHINE SHOP.

Charles A. Wardner, Director of Industrial Education, Olean, N. Y.

We started a department of automobile mechanics in connection with the machine shop in our high school.



Details of Rocking-Horse-Teeter-Totter.

TWO COMPLETED DRAWING TABLES.

The greatest difficulty was experienced with the problem of how to prevent the students getting their hands so blackened at this work it would take a long time and much scrubbing to get them clean again. Various plans were tried with indifferent success until at last we tried using automobile or paste soap on the hands before starting to work.

A piece of the paste soap about the size of the end of one's finger is sufficient, if well rubbed in, to give the hands a soft, pliable coating quite like a pair of rubber gloves. Too much soap or not rubbed sufficiently, will make the hands sticky and leave a disagreeable coating on the handles of tools, etc. A little experimenting will demonstrate the right amount to use for each individual.

The "soap gloves" will wear for about an hour of ordinary work and then the hands should be washed. By using soap protection on the hands the time of washing is reduced from five minutes to one minute and cold water can be used. This was found to work so well each of the car owners now carry a can of the soap in their tool box, together with a bunch of paper towels, to use when making roadside repairs or adjusting engine.

A FOLDING BREAKFAST TABLE.

L. C. Heironimus, Minneapolis, Minn.

The table illustrated on this page may be used for a breakfast or card table or by dropping a leaf and placing it against a wall as a serving table. When folded it takes up very little space. As a project it requires careful measurements and accurate work without being too difficult for the average boy.

The lettering is explained as follows:

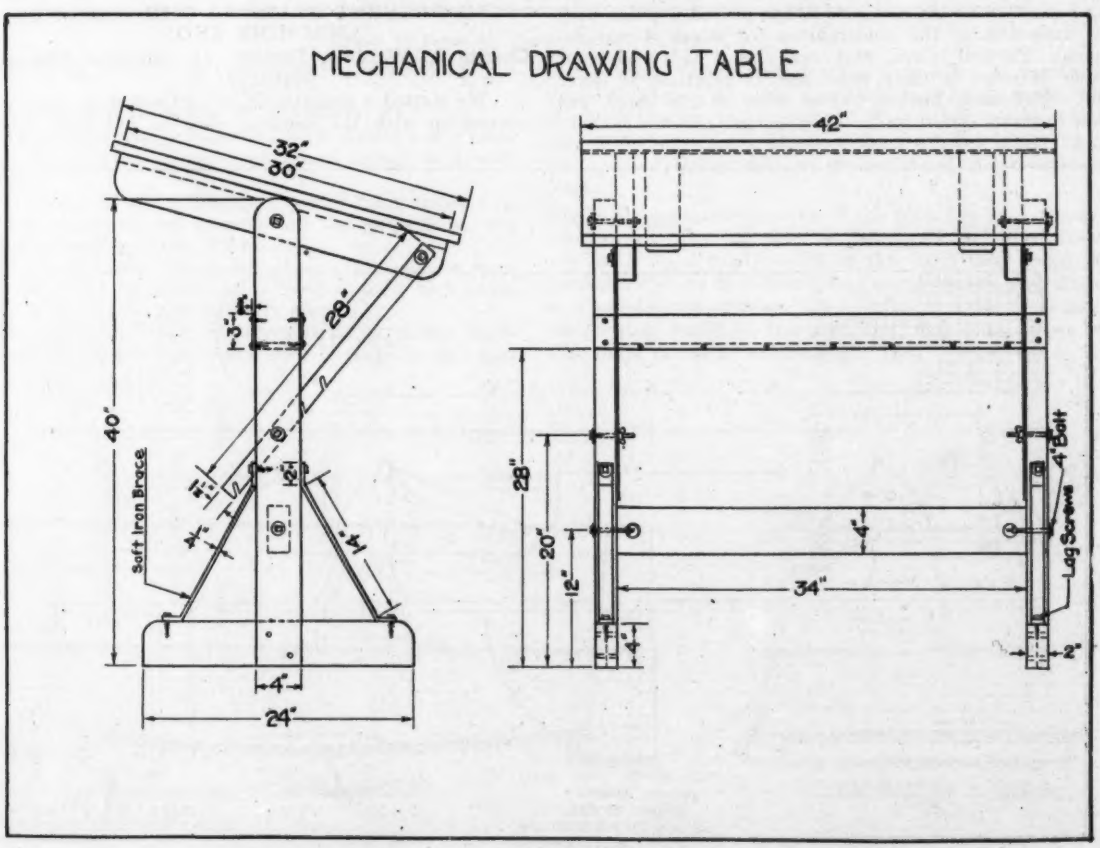
D—swinging legs; S—stop for D; C—wide legs; H—board screwed to center piece of top; E—block screwed to H and C for additional strength; M—center for pivots; A—arms; B—braces; K—cross piece.

H is nailed to C with 8d. finish nails. B and K are nailed to C with 8d. finish, set and filled with colored putty to match stain.

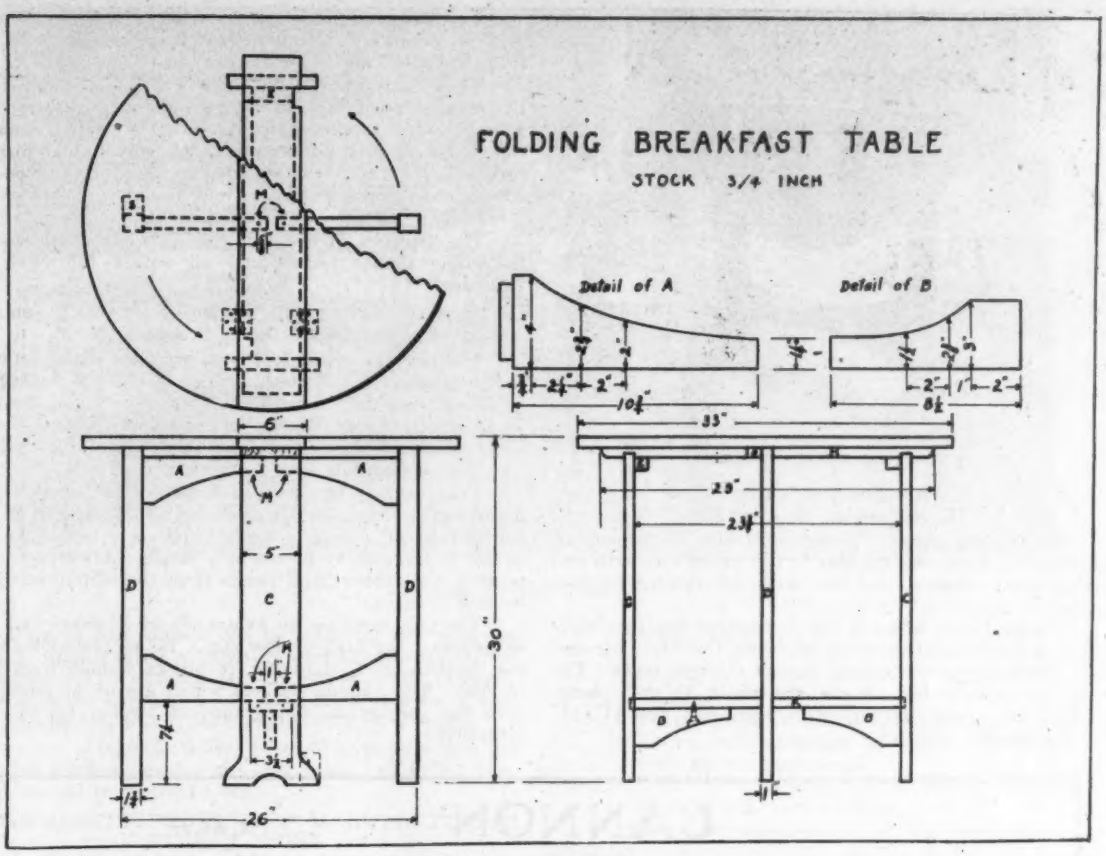
The lower part of C is a matter of design and can be made from a 6″ board dressed to 5″ with blocks doweled and glued as indicated.

The legs D may pivot on a hidden dowel or round head screws.

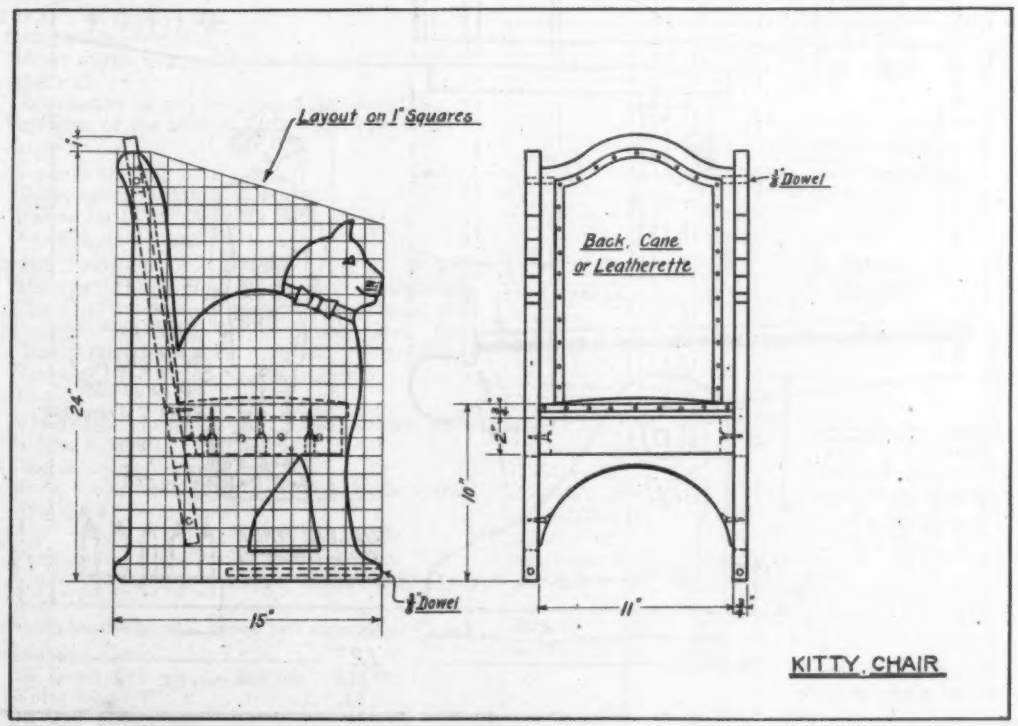
If hidden dowels are used, cut four dowels 1″ long. Bore holes 1″ deep in H, and lower arms A from bottom. Bore holes ¼″ deep in upper part of upper arms A and in K. Put dowels in 1″ hole and slide in arms which have been glued to D and the dowels will drop back ¼″. To remove dowels turn table upside down. One-half of the hinge is set between H and the top board, thickness of hinge being removed from H.



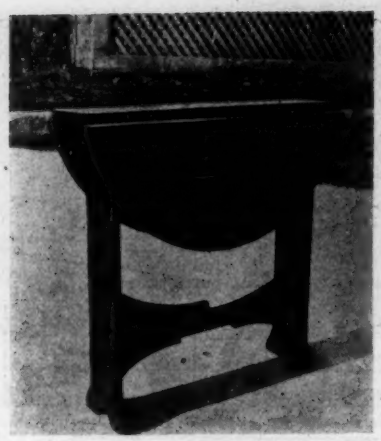
Details of the Drawing Table Made and Used in the High School at Greeley, Colo.



Details of Folding Breakfast Table.



Details of Child's Chair or Rocker.



BREAKFAST TABLE—FOLDED.

A KITTY CHAIR.

H. Burroughs, Batavia, Ill.

The child's chair illustrated in the accompanying drawing has been very popular in the writer's seventh and eighth grade classes, and has made an interesting and attractive toy.

The chair can be made any convenient size by simply using a mechanical drawing of it on the basis of one-half, three-quarters, one-half, one or a larger scale. The writer's students have made the chair 15″x24″, large enough for a child six or seven years old, and 11″x18″ for the smaller children.

The seat and back can be covered with leatherette or cane, or may be left plain. If leatherette is used the seat should be covered before placing it on the chair.

The construction of the chair is of the simplest kind; the back extends to within three or four inches of the floor in order to more securely brace the chair. Rockers can be put on with a little additional work. With a little care the chair may be completed in such a way that all screws are concealed on the under side of the wearing surfaces.

The features of the cat and all other markings of the chair should be painted on before the chair is varnished.

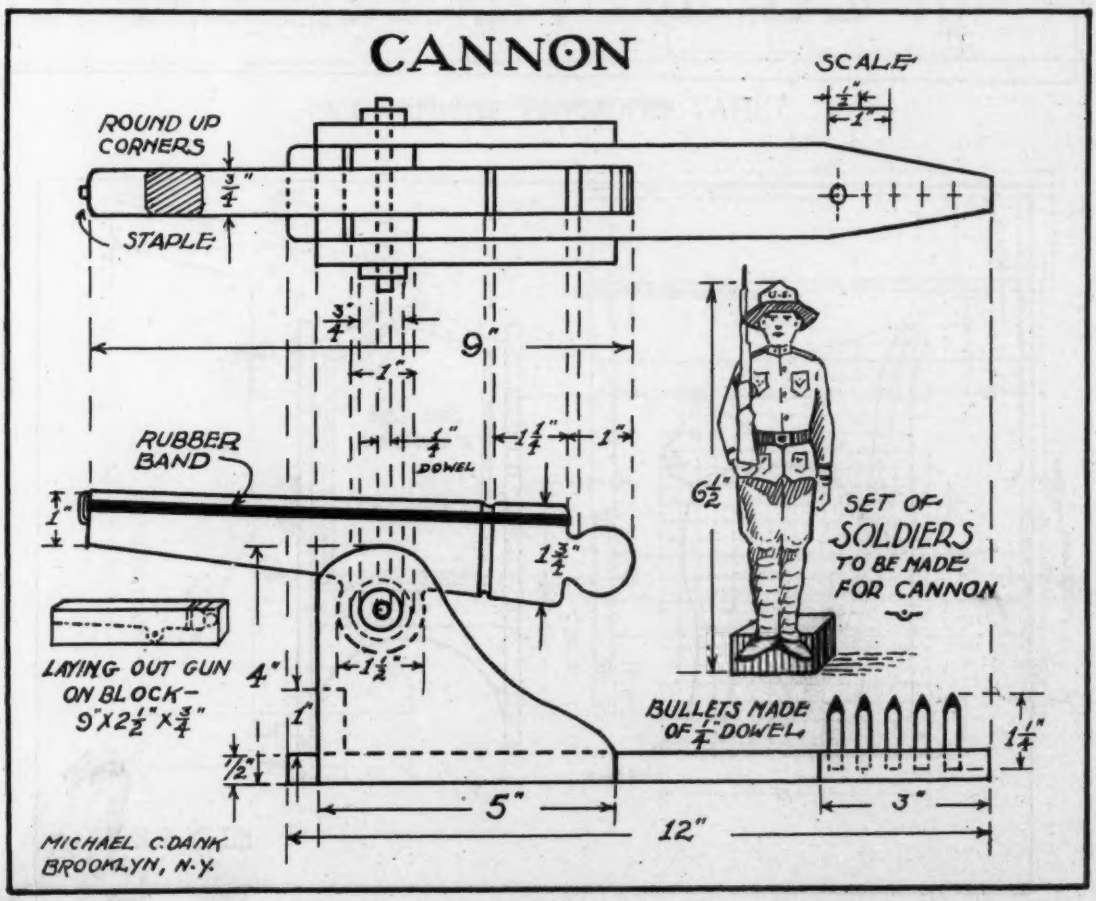
THE CANNON.

By Michael C. Dank, Brooklyn, N. Y.

The purpose of this toy is to simplify the cannon so that a youngster will not have any trouble in making it. It introduces, too, a further use of the "bean shooter" idea, which is very popular with the boy. It also does away with the difficulty of making a round barrel in which a perfect hole must be bored.

This cannon is equipped with bullets made of ¼″ dowel rod and its power is produced by the expansion and contraction of a rubber band which is attached to the nozzle of the gun by means of a staple. After each shot is fired, the rubber band hangs from the staple, ready to be loaded again.

The gun turns on an axle made of ¼″ dowel and can be adjusted for high or low aim. Being placed between two washers of 1″ diameter, it cannot wabble from side to side. The outside washers which are of ⅜″ diameter, give the cannon an appearance of strong, bolted construction.



A Toy Cannon.

The Class at Work Making the Signs

A set of five soldiers can be made for use with the cannon, thus making a game in which marksmanship is a feature. The soldiers can be cut of 3-16″ three-ply wood with the coping saw. A small block of wood is used as a standard to which the soldiers could be attached.

As for a suitable finish, I would suggest a medium gray for all parts except the base, nuts and bullet tops, which should be painted black.

A COMMUNITY PROJECT OF MANUFACTURING STREET SIGNS.

H. P. Stearns and R. E. Bates, Instructors, Dixon, Illinois.

The following outline contains the steps taken by the classes of the Manual Arts Department of the Dixon High School, in carrying out a community project of making street signs for the city.

1. The Community Project.
   a. Street signs suggested by Evening Telegraph editorial.
   b. Cooperation of city by paying for materials.
   c. Students of the Manual Training Department to do work.
2. Selection and Cutting of Stock.
   a. Choice seven-eighth inch cypress.
   b. Size to be 13/16″x3½″x23″ finished.
   c. One thousand signs to be cut.
3. Paint and Painting.
   a. Mixture. Dutch Boy White Lead, Turpentine, Raw Oil, Turpentine Japan Drier, Tinted with Prussian Blue, as per Formula taken from "Health and Milligan's Practical Painting" and National Lead Company's Handbook.
4. Stenciling.
   a. Adoption of standard size plain Roman block letters 2½″x1½″.
   b. Common stencil paper used.
   c. Mark, cut letters with chip-carving knife against plate glass.
5. Lettering.
   a. Mark around stencil with sharp pencil.
   b. Apply good black carriage paint with small brushes.
   c. Short bristle stencil brush not successfully used.
6. Materials and Cost.

a. 750 board feet cypress lumber	$82.50
b. White lead	18.00
c. Oil and turpentine	41.00
d. Stencil paper	2.10
e. Buggy paint	2.00
f. Total cost	$145.60

7. Shop Results.
   a. Development of standard lettering.
   b. Thoro understanding of paint mixtures and their action upon wood.
   c. Discovery of special talent among students as sign painters and letterers.

To show their appreciation of the co-operation between the school and the city, the city council has decided to give a banquet to the classes taking an active part in the development of this community project.

PROGRESS SHEET.

Gilman E. Calkins - Recorder

Name	Printer	Time	Cutter	Time	Total Time	Signs Made	✓
River Street	DANIEL GILMER	1 hr.	CLIFFORD GUMM	½ hr.	1½ hrs.	3	
First Street	PAUL WOOD	1 hr.	GILMAN CALKINS	¼ hr.	1¼ hrs.	15	
Second Street	Harry King	½ hr.	George Algeo	½ hr.	⅔ hr.	15	
Third Street	Harry Pardise	1½ hr.	Clifford Gumm	½ hr.	1½ hrs.	15	
Fourth Street	Clarence Hill	1½ hr.	William Curran	½ hrs.	1½ hrs.	8	
Fifth Street	Charles Hubbard	½ hrs.	George Algeo	½ hr.	1½ hrs.	9	
Sixth Street	William Hoyle	1½ hr.	Thomas Cypers	½ hr.	1¾ hrs.	14	
Seventh Street	Leslie Brenner	1 hr.	Ernest Hennings	½ hr.	1½ hrs.	12	
Eighth Street	Ralph Bacon	½ hr.	Ernest Steyer	½ hr.	1½ hrs.	10	
Ninth Street	Harold Tuttle	1½ hr.	Clifford Gumm	½ hr.	2 hrs.	16	
Tenth Street	Earl Hall	½ hr.	Ralph Bacott	½ hr.	1 hr.	4	
Eleventh Street	Fred Manning	1½ hr.	William Curran	½ hr.	2 hrs.	2	
E. River Street	LETTER "E"	ADDED.				7	
E. First Street						5	
E. Second Street						9	
E. Third Street						8	
E. Fourth Street						7	
E. Fifth Street						5	
E. Sixth Street						5	
E. Seventh Street						5	
E. Eighth Street						5	
E. Ninth Street						2	
Poplar Street	Theodore Hintz	1 hr.				8	
Cedar Street	Byron Steyer	1 hr.	Gilman Calkins	½ hr.	1½ hrs.	4	
Spruce Street	Francis Hennings	1 hr.	Ralph Swearingen	½ hr.	1½ hrs.	4	
Pine Street	William Hoyle	1 hr.	Mac Morton	½ hr.	1½ hrs.	4	
Patrick's Court	Mac Morton	1 hr.				2	
			INSTRS.		H.P. STEARNS R.E. BATES		

Suggestive Form used in Recording the Progress of the Work.

THE WESTERN ARTS ASSOCIATION AT DETROIT.

Whatever the Convention of the Western Arts Association at Detroit lacked in the way of attendance it made up in enthusiasm and in the strength of its program. The convention very strongly emphasized the art interests in the membership but by no means excluded the vocational and manual training phases of education in which the members are engaged.

The city of Detroit and the surrounding communities sent large delegations to the meeting, but the attendance from the states which are at some distance was disappointingly small, due in part to the increased expense of traveling, and in part to the general unsettled conditions in the school field.

Mr. Harry E. Wood and the small group which cooperated with him are deserving of much credit for the manner in which they handled a discouraging situation. Miss Buckley's resignation early in the year made it necessary for Mr. Wood to undertake the preparations for the meeting and to fill in the lapses in the program.

The convention opened on Tuesday evening, May 4th, with addresses of welcome from local official and educational personages. The principal address was that of President Harry E. Wood who set the key-note for the meeting. He urged that the association which in the past stood for correlation between manual training and art instruction, and more recently took up war problems and reconstruction problems, should now seek to make America more artistic. He declared that we are making great strides in public monuments, in art collections, etc.; that we need the more general diffusion of art among the people, especially in the common things of life, those things made of wood, clay, metal, concrete, paper, etc., with which we live every day. He declared that in the schools we are stressing too much individual projects which are little things in themselves and are failing to recognize the fundamental purposes of the schools, namely, the development of boys and girls.

In discussing art instruction in the schools, Mr. Wood urged: "I believe the public schools have had and will have more to do with raising the standards of art in common things than any other force, because, thruout art and drawing courses we are training the few designers of tomorrow and we are opening the eyes of tomorrow's consumers to the excellence it is possible to attain. They will demand and the designers will, therefore, produce things of beauty for common use. Why shouldn't the common things be beautiful?

"The time was when we did not have art in the public schools. We had drawing. Well do I remember the 'artless' drawing books we used. I will never forget those pages on which the shape of one-half of a vase was given and we were expected to draw the other side exactly like it. It is true that they were drawings of vases, but we never heard the name Rookwood, Teco or Van Briggle. As for learning anything about how vases were made, or of what they were made, the color, the glaze, and where the best examples were produced—no one ever dreamed of that! But we have outgrown that stage. Our drawing books are full of accurate reproductions of beautiful things; they contain many examples of art in industry.

"We tried to draw pictures of chairs and furniture, but they had no relation to interior decoration. That was before the day of manual training in the schools and no one would have dared to suggest the construction of such things in the schoolroom. Finally, however, the wood working shop became an established and accepted fact and today manual training is not confined to the wood working shop only. There is mechanical drawing, printing, sheet metal work, concrete work, electric wiring and construction, shoe repairing, etc., each developing practical things.

"Instead of just drawing for the girls, they spend a share of their art time in designing costumes having pleasing color harmony and a style appropriate to the dictates of fickle fashion, yet particularly adapted to the figure with which Fate has adorned or afflicted each one. How many girls have come to their teens actually handicapped by ill fitting, poorly constructed clothing, just because their mothers had neither knowledge, ability nor taste and the girls themselves knew no better. How many girls have gone out to make homes for themselves without even a beginning acquaintance with the most elementary kinds of sewing—the kinds without which it is almost impossible to keep a house in running order!"

The final address of the evening was a discussion of "Art Education of the Consumer" by Rossiter Howard, Director of the Minneapolis Institute of Arts.

The second session on Wednesday morning was devoted to two typical addresses by men who are enthusiasts in their respective fields, and to whose message teachers listen with unfailing interest. Mr. Hugo B. Froehlich spoke on "Color Knowledge a Universal Necessity", and Professor Arthur F. Payne discussed "Art and Undeveloped National Resources."

On Thursday morning Mr. C. Valentine Kirby, Director of Art at Pittsburgh, took up the problem of promoting our education under the title of "Advertising in Selling Our Goods." At this same session Miss Lillian Cushman Brown of St. Paul discussed "Industry and the Creative in Education", and Mr. Rossiter Howard took up "Balance in Composition."

The strongest address of the general sessions was delivered on Thursday evening by Gerrit A. Beneker of the Hydraulic Pressed Steel Company, Cleveland, Ohio. Mr. Beneker, in discussing art and labor, told of the work he is doing in one of the great steel plants of the United States. He spoke of his studio which is in the shadow of the smoke stacks of the plant and in which he paints the men as they are at their work. His paintings of the men and of the machines and buildings of the plant are reproduced in the house organ of the corporation in full colors. Mr. Beneker not only dignifies the men and the plant in his paintings, but also in brief appreciative articles which he prepares.

The round tables during the convention were unusually well attended and gave evidence that for practical value which can be applied in the classroom they are rather superior to the general inspirational meetings. The printing round table on Wednesday morning was presided over by Katherine M. Stillwell. Addresses were made by Laura E. Holmes, Mr. Ernest Deterer, and Mr. Chas. N. Walker. The last mentioned speaker took up "Typographical Lay-Outs, Their Construction and Value."

In the absence of Mr. Kissack, the manual training round table was presided over by Mr. A. C. Duncan of Cleveland Heights, Ohio. The speakers included Mr. Harold W. Gossett who took up "The Use of Jigs in the Manual Training Shop", Mr. Hugo B. Froehlich who spoke on "Color and Design", Mr. Matt J. Scherer who spoke on "Manual Training in the Commercial High School", and Mr. H. M. Kurtzworth who spoke on "Industrial Design."

The vocational round table was presided over by Prof. Chas. A. Bennett, Editor of the Manual Training Magazine, Peoria. Prof. Geo. E. Myers spoke on "The Methods Employed by Industry in Meeting the Problem of Industrial Education." Miss Helen Livingstone of Detroit presented the subject "What the Schools Can Offer in a Practical Course in Home Making", and Prof. Arthur E. Payne took up the "Part-time School."

The annual banquet was presided over by Miss Alice M. Guysi. The general topic of the evening was "A More Artistic America." The speakers included Mr. Walter S. Perry, Miss Bertha Goodison of Ypsilanti, Miss Rose Crane of Chicago, and Mr. Clyde M. Burroughs of Detroit.

The freight embargoes and the general difficulties of transportation caused the exhibit of manual training to be considerably smaller than usual. However, the exhibits which were made were of unusually good quality and aroused considerable comment.

The policy adopted by the officers of the association in not encouraging commercial exhibits during the convention proved to be a serious mistake. The expenses of the meeting were considerably above the income and the association will be obliged to draw upon its reserve to make up the deficit.

The annual business meeting was enthusiastic and indicates that the coming year will see renewed activity in the work of the organization. The officers elected are: President, Miss Ruth Raymond, Head Department of Art Education, University of Minnesota, Minneapolis, Minn.; Vice-President, Albert F. Siepert, Prof. of Manual Arts, Bradley Polytechnic Institute; Auditor, Miss Laura E. Holmes, Teacher of Printing, Chicago Public Schools; New Member of Council, Harry E. Wood, Director of Manual Training, Indianapolis Public Schools; Chairman of the Manual Training Round Table, Harold W. Gossett, Teacher of Manual Training, Indianapolis, Ind.